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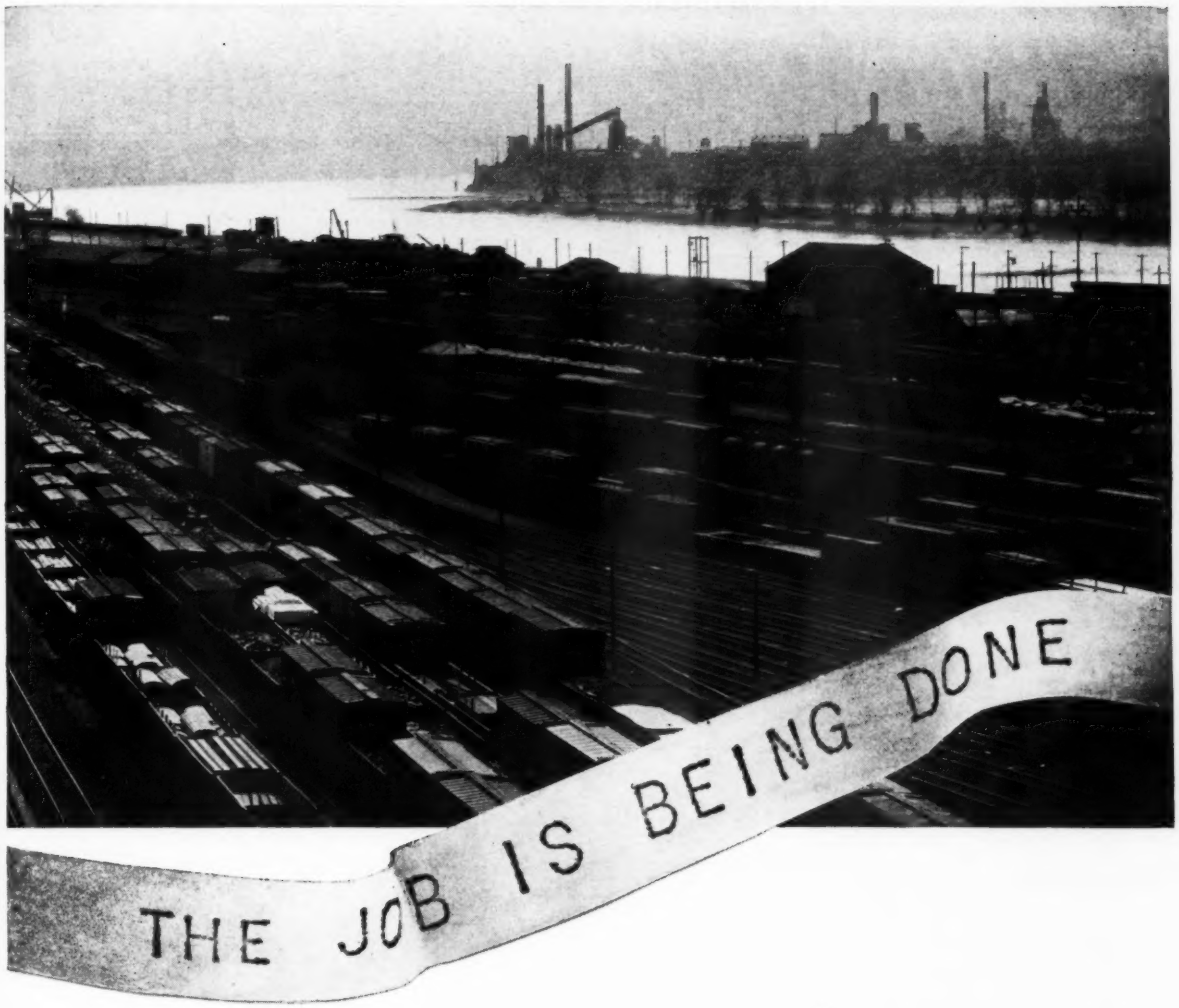


Current carloadings tell the story of the heavy demands the war is placing on America's railroads.

They're rushing the tools of production to manufacturing plants. They're taking raw materials to processers, parts to assembly plants, and delivering fighting equipment to the services. They're carrying most of the steel that is the key material in all these operations, as well as much of the ore, coal, limestone and scrap that go into making the steel. It's a big job, the biggest in railroad history.

The job is being done, in spite of difficulties and shortages of needed supplies and equipment. The fact is, of course, that railroad suppliers, like the roads themselves, have their problems. Bethlehem, for example, while responsive to the needs of its railroad customers is called upon to turn out large tonnages of steel products for the war effort.

But the maintenance of swift, efficient transportation is one of the essentials of rapid production of war materials. Therefore, while producing steel in ever-increasing quantities for the war effort, we are bending every effort to supply the railways of America with the rails, track equipment, wheels, axles, plates and other products urgently needed in this time of crisis.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

SHIP THE SCRAP TO BLAST THE JAP!

THE UNITED STATES needs every available ton of steel scrap now! Hundreds of old rail-type highway crossings now in service are sources of high grade steel scrap.

Check over those rough-riding steel crossings of yours now . . . ship the scrap to blast the Jap! . . . and for maintenance-free satisfaction specify Moss Ready-Made Crossings for replacement purposes.

Crossings like this yield about 18 tons of steel scrap

MOSS READY-MADE CROSSINGS

ELEVEN YEARS of continuous service without maintenance expense . . . that's the record of many Moss Ready-Made Crossings that are carrying some of the heaviest and densest truck-traffic in the United States.

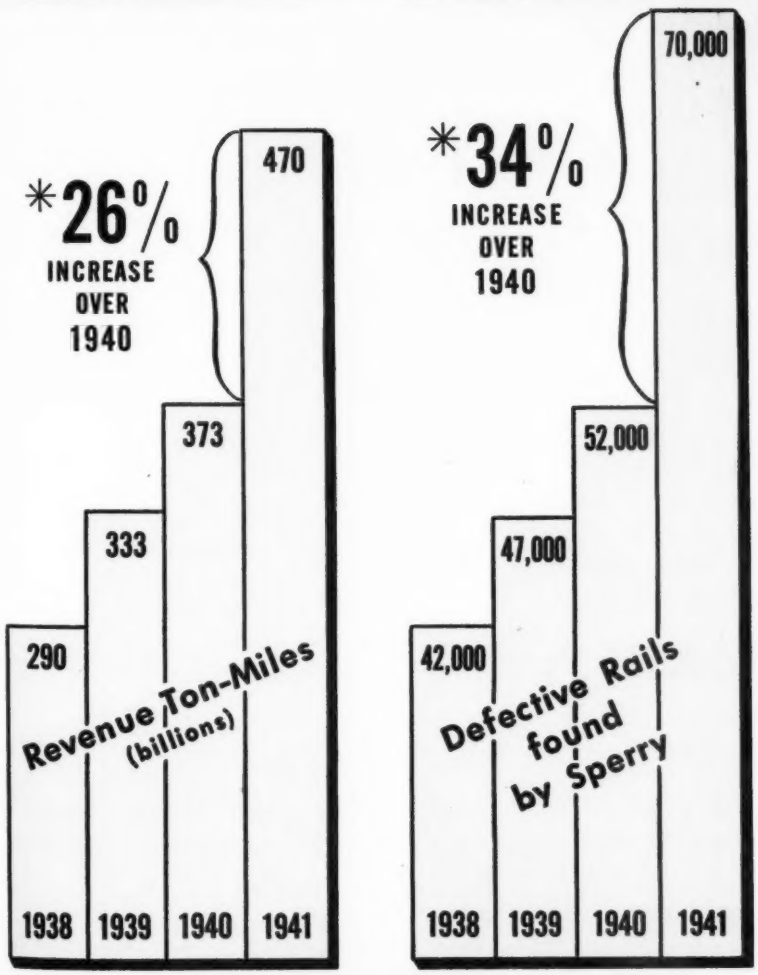
After eleven years Moss Crossings are just as smooth and just as firmly in place as the day they were laid . . . and railway engineers say they're good for at least *10 years additional service.*

The wise maintenance officer makes his replacements with Moss Ready-Made Sectional Highway Crossings . . . designed for heavy duty . . . made of Black Gum to resist abrasion and wear . . . Creosoted for permanence . . . a small gang can install them without special tools . . . no need to detour highway traffic for future track maintenance . . . and they're low in first cost. Write for full particulars.

The Stamp of Character FOUNDED 1879 MC

T. J. MOSS TIE COMPANY

SECURITY BUILDING **ST. LOUIS, MO.**



** NOTE: Improvements made to Detector Cars of Sperry Rail Service contributed to the increased proportion of Defective Rails found in 1941.*

1942

It is estimated that in 1942 the number of Revenue Ton-Miles handled by U. S. railroads will be greater than ever before.

Increase in traffic means increase in number of defective rails in track.

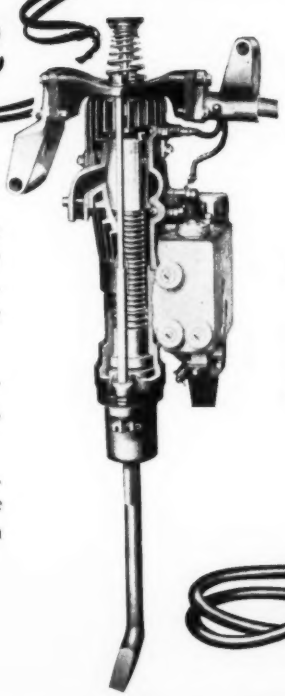
Maximum Rail Safety can be assured only by frequent testing with Modern Detector Cars.

SPERRY RAIL SERVICE

Hoboken, N. J. **Chicago, Ill.**

BARCO Unit Tytampers

ESSENTIAL FOR *Economical Maintenance*



NOW USED BY 88 RAILROADS

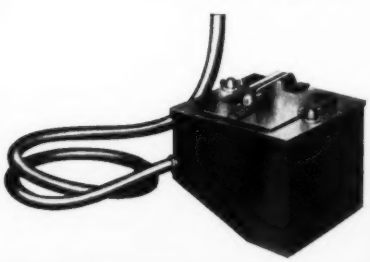
With high speed trains demanding better track surface and alignment . . . with current conditions calling for maximum output per man-hour . . . BARCO UNIT TY-TAMPERS will prove to be an invaluable part of your work equipment.

Entirely self-contained . . . *no auxiliary equipment necessary* . . . can be quickly assembled for gang tamping, or readily distributed for spot tamping.

The advantages are obvious . . . more time *on the job* . . . maximum production from the operators . . . inevitable cost reduction . . . and the kind of track to meet modern requirements.

BACK BY A RECORD OF SIX YEARS SATISFACTORY SERVICE

Initial capital expense is lower and year-around performance in tamping, crib busting and ice breaking, add to their efficiency.



BARCO MANUFACTURING COMPANY

1805 W. Winnemac Ave. Chicago, Illinois

In Canada:

THE HOLDEN COMPANY LTD

Montreal Moncton Toronto Winnipeg Vancouver

WELDED PIPING SYSTEMS
Are Leakproof and Maintenance-Free

• Oxy-acetylene welded piping systems remain leakproof and maintenance-free for the life of the pipe, because the welds are as tight, strong, and ductile as the pipe itself. Pipe systems for all types of service —water, steam, gas, air, or oil—are installed at low cost by means of oxy-acetylene welding. In addition, welded pipe is trim and modern in appearance, occupies less space, and may be installed in cramped quarters or locations where space is limited. Oxweld methods and equipment help the railroads install welded piping to achieve substantial savings.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York

OXWELD RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

The word "Oxweld" is a registered trade-mark of a Unit of Union Carbide and Carbon Corporation.

TO RAILWAY SUPPLY MANUFACTURERS

"It's Service We're Selling Now"

"Bill, what's the matter with Jim Brown?" asked the railway sales manager of his star railway salesman.

"You mean the chief maintenance officer of the X-Y Railroad," replied the salesman.

"Yes, I met him the other day and he said he hadn't seen you for months."

"That's right, Boss, it *has* been a long time but don't forget that I've got a lot more people to see now since you took George Smith off his territory to 'chase materials' for the shop and turned over his roads to me too."

"That's true, Bill."

"And, Boss, I've been staying away from some of these people like Jim Brown, too, because I know they want our product and we haven't any to sell."

"That's wrong, Bill, and it's unfair, too."

"What do you mean, Boss?"

"Just this, Bill. Jim Brown has been one of your best customers for years. He's bought a lot of our equipment. And now when he needs more and we can't let him have it, you run out on him."

"I'm not doing exactly that, Boss. But if I can't help him, I'll avoid an argument by staying away from him."

"But you can help him, Bill."

"How's that?"

"By showing him how to get more service from the equipment of ours that he already has. *You* know more about its possibilities than he does. *You* know how to keep it in condition. *You* know more about making make-shift repairs that will tide it over until we can get parts for him again. *That's* the help he needs now."

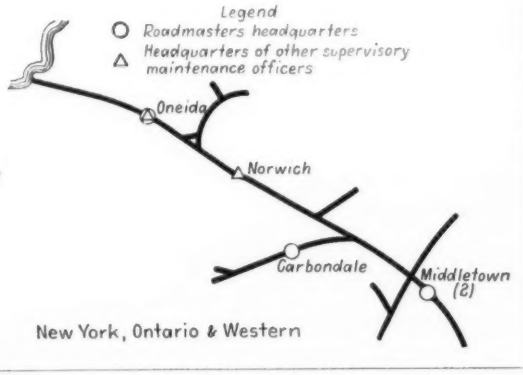
"Boss, it's physically impossible for me to see every one of our customers now as frequently as I used to—even though, as you say, they need our help more than ever before. Why can't we use our advertising in *Railway Engineering and Maintenance* to give them our ideas? That paper reaches *all* of *our* customers and a lot more, too, and if we can get our service helps over to them in that way, we will reach them a lot quicker than if they have to wait until I can get around to see them."

"Bill, you're dead right. That's the idea that we should play up in our advertising. We've got service to deliver now—service that we included in the sales we've made in the past and service that will bring us more orders when this thing's over. We'll *increase* our advertising in order to stand behind our friends now when they need us."

"I'm glad to hear that, Boss, for this advertising will not only help Jim Brown and men like him on other railroads but it will build goodwill for me and it'll keep these railroads from forgetting me when I'm dividing my time between two territories."

"That's right, Bill, and it'll let us get the jump on the A-B-C Company while it's suspending its advertising and calling its men off the road because, as they say, they've nothing to sell."

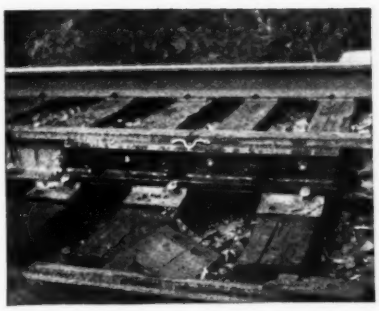
★ **Railway Engineering and Maintenance** Goes Every Month to the **Assistant Engineer Maintenance,** to the **Four Roadmasters,** to the **Supervisor of Tracks** and to **Five Other Subordinate Maintenance Officers** Who Are in Training for Promotion to Supervisory Positions on the **New York, Ontario & Western.** ★



RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

SAVE SAVE SAVE

WITH R M C PLASTIC



Molded blocks of R M C Plastic are placed on the inner faces of the joint bars before they are bolted to the rail, the bolting action solidly packing the plastic into every section of the joint assembly.

The above illustration shows the splice removed 8 years after packing with R M C Plastic. Note that rail, joint bar, bolts and nuts are completely free from corrosion.

Many leading railroads are aiding National Defense in a vital way. They are immunizing thousands of rail joints against corrosion and wear with R M C Plastic, thus increasing rail life by many years and practically eliminating parts-renewals.

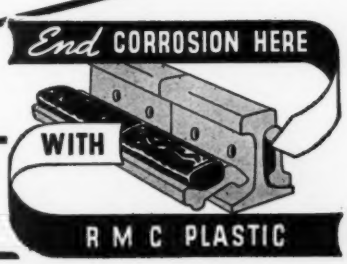
SAVE Steel with R M C Plastic which acts as a metal preserver and lubricant, permitting proper expansion and contraction of the rail at all times, eliminating "frozen" joints and destructive rail end batter.

SAVE the extra cost and labor involved in periodic hand oiling of joints. R M C Plastic does the job once and for all, quicker, more thoroughly and permanently.

SAVE with R M C Plastic in protecting existing track and in assuring many years of additional service to new rail. Remember, a small application of R M C Plastic provides maximum protection to the steel rail, conserving a highly critical defense material at negligible cost.

☆ ☆

NO HIGH PRIORITIES on R M C PLASTIC
YOU CAN GET ALL YOU WANT WHEN YOU WANT IT



RAILWAY MAINTENANCE CORP.

PITTSBURGH **PENNSYLVANIA**

. . . and the Army and Navy, too!

WE cheered their heroism, their daring, their never-say-die spirit at Wake Island, for example.

Over and over in conversation, editorials, speeches, and every other form of verbal bouquet we told them how fine we thought they were. And how solidly we stood behind them.

But now comes the time when we've got to tell all that to the Marines and the Army and Navy in something more substantial than mere words.

Demonstration—not conversation—is called for now!

We've got to increase and maintain the club-houses which the men can use on their time off. 432 are already operating now. But that's not nearly enough.

We've got to help keep up their spirit by keeping boredom and monotony out of their lives. A fighter needs entertainment for his mind as well as guns for his hands, uniforms for his back, food for his stomach.

The USO camp shows are bringing the world's best entertainment to the armed forces. But we've only started!

Mobile units for troops in remote positions . . . troops-in-transit service at transportation stations . . . book gathering and distributing . . . these are just a few more expanding services the U S O is giving.

For the U S O—and you—are charged with the vital duty of helping keep up morale.

Fighting spirit is a real, a vital, a specific thing. An instrument of war like bullets, bombers, and tanks. Without it no victory can be won.

So it's your move now, Mr. and Mrs. America. That fountain pen you sign your check with is a machine gun today. Will you *start shooting?*

Send your contribution to your local campaign chairman or to National Headquarters, USO, Empire State Bldg., New York City.

★ USO ★

Cars That Carry No Cattle

HELP SHIP PRIME BEEF TO ALL AMERICA

Rancher, stock-feeder, packer and consumer all benefit from the "free markets" made possible by the wide-spread shipping facilities of American railroads. Contributing to the dependability of *rail* shipments are thousands of Fairmont Railway Motor Cars in the service of track supervisors, signalmen, and section gangs. For, without efficient maintenance-of-way, the fast freights could not get through. To meet the many diversified requirements of maintenance service, Fairmont has engineered the world's most complete line of railway motor cars. There is a combination of Fairmont Cars exactly suited to your railroad hauling needs. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

Fairmont
RAILWAY MOTOR CARS

FAIRMONT A3 SERIES C

Three to Eight Men, One to Seven Trailers, 2,000 Lb. Load Capacity

Performance ON THE JOB COUNTS

FAIRMONT M14 SERIES E for all light section service.

FAIRMONT 59 SERIES D car in signal maintenance work.

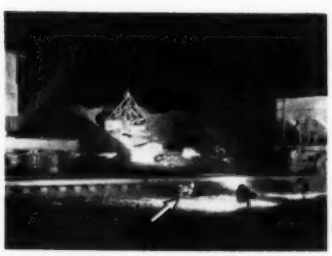
OF ALL THE CARS IN SERVICE TODAY
MORE THAN HALF ARE FAIRMONTS

Keeping "Main Street" Open

HOMELITE Portable GENERATORS

An 1800-watt Homelite Generator weighs only 83 pounds. It is readily put in operation anywhere. One man can carry it easily. And when in operation, it requires no manual attention.

A Homelite furnishes plenty of power—enough to operate saws, drills, dappers and many other tools. Voltage control is completely automatic regardless of load.



A Homelite Portable Generator is a twenty-four hour worker. Use it during the day for operating tools and use it during the night for brilliant floodlighting that men need to work with more speed and more safety.

Railroads are doing everything possible to prevent tie-ups these days. Troops and vital materials have to go places and do things without delay. And Homelite Portable Generators are playing a part in this speed-up program. Railroads are using them by the hundreds to provide their section gangs with power for operating time-saving electric tools as well as for floodlighting jobs at night. Every time these Homelites are used repairs are speeded. Costs are cut. Delays are prevented.

FREE TO HOMELITE USERS

Send for this free service manual that shows how to keep your Homelite Generators in perfect running condition. When writing for copies, specify the model and serial numbers of the units you now use.

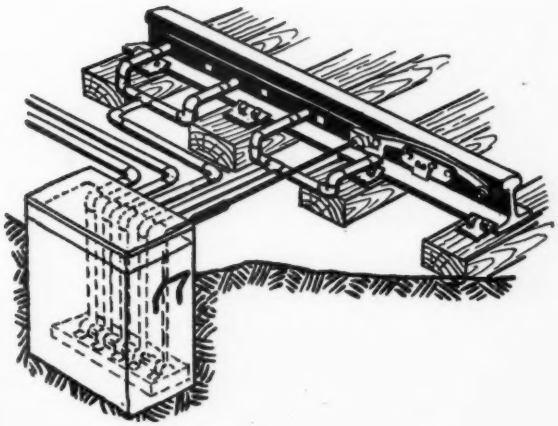
Homelite Corporation

2106 RIVERDALE AVENUE, PORT CHESTER, N. Y.

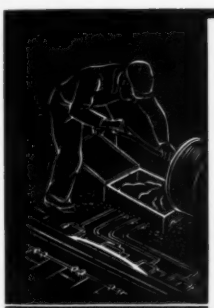
RACOR

RAIL LUBRICATORS

Save Rails and Wheels



Installations Quickly Paid for by Reduced Replacements



HOW THE LUBRICATOR WORKS

❶ *Operator fills reservoir and oils exposed parts.*

❷ *Passing wheels pick up grease from the delivery rail.*

❸ *And deposit it on the rails at curves which may be several miles away from distribution points.*

Extensive tests with the Racor Rail Lubricator prove that this automatic method of lubricating curves is quickly paid for by the savings resulting from the longer life of rails and wheels.

Rugged construction and simple design of the lubricator reduce inspection and maintenance to a minimum. Installations made at the start of a curve will provide protection for 360° of included angle curvature, since car wheels will carry the lubricant without appreciable waste to the points where it is needed.

RACOR **RAMAPO AJAX DIVISION**

THE AMERICAN BRAKE SHOE & FOUNDRY CO. • 230 Park Ave., New York

No. 162 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Circulation and Readership

June 1, 1942

Dear Reader:

In every test that we make of the extent to which subscribers to Railway Engineering and Maintenance share their copies of the magazine with associates, we find that the number of readers exceeds three times the number of subscribers. This comes through supervisory officers making their copies available to members of their staff; it comes likewise through supervisors sending their copies to their foremen in turn.

Such action provides tangible evidence of the value that these subscribers place on our magazine that is very gratifying to us; yet it suggests also how much greater value would accrue if each of those persons who now has opportunity to read the paper through the generosity of an associate had a copy of his own which he could retain and study more thoroughly and at greater leisure.

I am thinking also of the subscriber who permits his copy to pass out of his possession and thus loses its reference value through inability to refer back to it when some question arises that he recalls was discussed in an earlier issue. That such a value is very real, especially in these days of such rapid change, is evidenced by the number of our readers who take great care to keep their files of our issues intact in either loose or bound form. It is evidenced also by the many calls that we receive for references to information already published.

All of this leads me to suggest the following expedients to those of you who share your copies with others:

1. That,if you regularly permit your copy of Railway Engineering and Maintenance to pass out of your possession, you enter a second subscription for your personal use and file. This is a practice that many supervisory officers now follow to insure retention of a copy for their use and also to make the contents of the magazine available to their associates.

2. That you encourage those with whom you share your copy to subscribe for their own copies in order that they may thereby have maximum opportunity to study the contents at their own convenience. The cost is small, as you know, - only $2 for a year or $3 for two years - or less than the cost of a package of cigarettes a month.

On a number of roads, the managements subscribe for a sufficient number of copies to provide thorough coverage among their maintenance officers and foremen. On others supervisory officers encourage their associates and foremen to subscribe, frequently arranging for an assistant to act as a local agent (under an arrangement that I will be glad to tell you more about on request) to facilitate the handling of such subscriptions. Whatever the means, I have noted on many occasions that on those roads and on those subdivisions on which the magazine circulates most thoroughly, the supervisors and foremen appear more alert and better informed and seem to handle their work with greater efficiency. And is this not what you would expect from men who have access to the best thinking of the field and have opportunity to draw on the experience of these men?

Yours sincerely,

Elmer T. Howson

ETH:GP

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

FOR LOWER COSTS

on Reconditioning Crossings and Frogs

...use these time-proved AIRCO methods

Worn Frogs and battered rail ends are quickly reconditioned with the Airco Oxyacetylene Process — then heat-treated with the same torch for longer life. These operations may be done either in the shop as illustrated, or, on the road if desired. They are but two of the many ways in which the Airco Oxyacetylene Flame is cutting maintenance costs from coast to coast. » » » The practical experience and advice of the members of our Applied Engineering Department is at the service of Airco's railroad customers for problems such as rail end cropping, building up rail ends, hard surfacing, flame cutting locomotive and car parts, or in any other service in which Airco methods can be of assistance to you.

Air Reduction

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS

MAGNOLIA-AIRCO GAS PRODUCTS CO.

General Offices: **HOUSTON, TEXAS**

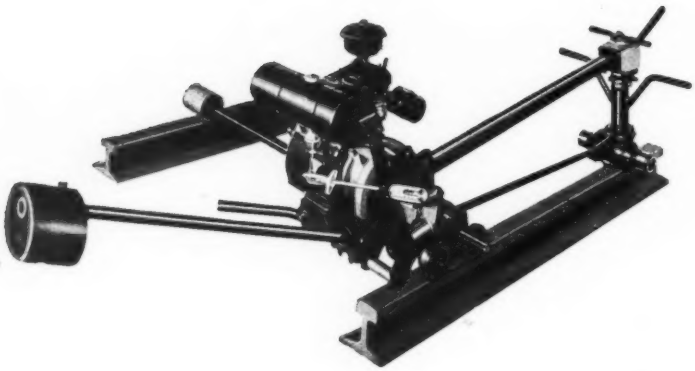
OFFICES IN ALL PRINCIPAL CITIES

AIRCO

WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS! *Keep 'em rolling for victory!*

Raco Power Track Machine



On 60 railroads they have established remarkable records for economy.

Ease of operation, lightweight, automobile type construction insure maximum speed and minimum service interruptions.

Tightening-out-of-face with the Raco lasts several times as long as hand tightening and insures uniform tension on all bolts.

Raco Tie Boring Machine

Bores holes for **screw** spikes or **cut** spikes.

Bores ties in track more than **twice as fast** as any other accepted means.

Bores holes **absolutely vertical.**

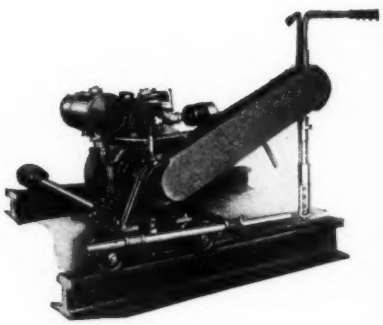
Locates all holes **exactly in center** of tie plate punching.

Automatically **controls depth** of hole.

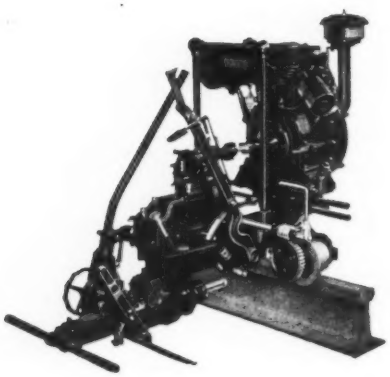
Chips are blown away as fast as made, leaving hole clear.

One-man operation.

Machine can be removed from track by one man.



Everett Power M-W Machine



For fourteen years the Everett M-W has been the **standard** power rail drill on practically all railroads.

Its design and construction insure the utmost in facility of operation and in speed and accuracy of adjustment.

It has made such astonishing records for economy that **no road can afford to use any other means for drilling bolt holes.**

RAILROAD ACCESSORIES CORPORATION

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(Chrysler Building)

New York

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PRINTED IN U.S.A.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JUNE, 1942

First Aide to ARCHITECTS AND ENGINEERS

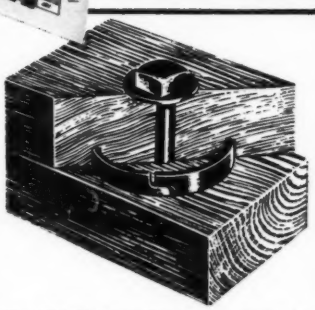
FREE

TO ARCHITECTS AND ENGINEERS

In *Typical Designs of Timber Structures* we have grouped the plans of 45 representative types of structures that have been engineered with TECO Connectors.

Among these drawings you will find helpful suggestions to answer design problems troubling you today. You will see how capably the TECO Connector System handles different types of timber structures . . . short-span trusses as well as longer ones.

This fine reference book is available . . . FREE . . . to any architect or engineer. Please write on your firm letterhead . . . or use the coupon below.



The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

Timber

ENGINEERING COMPANY, INC.

1319-18TH ST., N. W.
★ WASHINGTON, D. C.

YEON BUILDING
PORTLAND, ORE.

Timber Engineering Company, Inc.
Room 6-11, 1319 - 18th St., N. W.
Washington, D. C.

Gentlemen:

As yet I haven't received *Typical Designs of Timber Structures.* Please rush my copy.

Name.....

Firm.....

Address..... ★

Railway Engineering and Maintenance

Railways

Creating New Records

WE are now engaged in an all-out war—a war that has never been approached in magnitude and scope. It is demanding the maximum effort from many industries and we are hearing much, and justly, about the achievements of these industries. Yet no industry is showing greater capacity or providing a greater demonstration of efficiency than the railways. The manner in which the railways are responding to the tremendous demands upon them comprises a story of dramatic character—a story that should arouse pride in every railway employee because he has helped create it.

Two Initial War Years

To get a fair measure of this record, let us look back at the performance in our last war. We now have available the figures for the first two months of 1942. Let us compare them, therefore, with the record made during the same two months of 1918. In these two months of this year, the railways had about 10,000, or 39 per cent, fewer road freight locomotives available than in 1918. They had on their lines (including those privately owned) about 400,000, or 17 per cent, fewer freight cars than in 1918. Yet they rendered 59 per cent *more* ton miles of freight service than in the first two months of 1918. And they did this while maintaining an average *surplus* of 64,000 cars, as compared with an average net *shortage* of 92,000 cars in the first two months of 1918.

This performance was made possible by each locomotive moving 55 per cent more miles daily, by each freight car traveling 107 per cent further each day, and by each train carrying 54 per cent more tons. As a result, each locomotive produced 160 per cent more ton miles of freight service and each freight car 91 per cent more than in the first two months of 1918. And in 1918 the railways were operated by the government, while in 1942 they are in the control of their owners.

And it is surprising to many that the railways are now producing a volume of transportation that far exceeds that of the highest previous traffic year in history—1929. The comparison of current performance with that of the corresponding months of 1929 is enlightening. In the first two months of 1942, the railways had 7,400, or 26.5 per cent *fewer* locomotives, and nearly 500,000, or 20 per cent, *fewer* freight cars than in the same two months of 1929. In spite of this fact, they produced *17 per cent more* freight service than in the initial months of 1929—by securing 60 per cent more service from each locomotive and 46 per cent more from each freight car.

Such Records Don't "Happen"

Such a record is not made by chance. It is the result of definite, deliberate preparation. It is the result, first of all, of the investment by the railways of more than $8,000,000,000 in the improvement and expansion of the railway plant. It is the result also of improvement and refinement in methods, year after year, in which every phrase of railway operation has been speeded up. And it is the result in part also of the remarkable co-operation extended by shippers and receivers of freight.

It is through these means that the railways were able last summer to move an unusually large volume of grain from inland elevators to ports immediately in advance of the harvest and then to move new grain into the space thus released in these interior elevators to the full ability of the elevators at both ports and interior points to receive it. It is through these means also that the railways were able to move 80,116,360 tons of ore from the mines to the docks last year and established an all time record. They are preparing to raise this total to 90,000,000 tons this year if the boats can take it away. And it is through these means that the railways have increased their deliveries of oil to the eastern seaboard from less than 175,000 barrels a day a few months ago to more than 650,000 barrels a day now.

Private Operation Proves Merit

In these days when there are still a few who advocate unified operation under government control (although their voice is rapidly being drowned out by the record for efficiency now being made by the railways under private management) it is well to remember that the government was operating the railways in 1918, having taken them over in the closing days of the preceding year. In the first year of government operation (1918), the increase in freight traffic handled was less than 3 per cent; yet operating expenses increased 40 per cent. In 1941, by way of contrast, the railways handled 27.3 per cent more

traffic than in the year previous, with an increase of only 18.6 per cent in expenses. In other words, the roads absorbed an increase in traffic nine times as large with an increase in operating expenses only half as large.

And in spite of the tremendous up-surge in traffic that has occurred so suddenly, the railways have met *all* demands for service to date—and they expect to be able to continue this record. The problem is by no means simple, however, for the entire industry must continue in the high gear in which it is now moving. And in this no employees are entitled to more credit or bear a greater or more direct responsibility than those in the maintenance of way and structures department. It is through their activities that the tracks and structures have been so constructed and maintained as to carry this record traffic with greater safety and freedom from delay than ever before; that the water and coaling stations have so serviced these trains as to speed them on their way with minimum delay and, in addition, their own operations have been so conducted as to interfere least with the movement of this record traffic.

Maintenance Men "in the Service"

And in the days that are ahead, maintenance employees must remain in the vanguard, adding still further to the efficiency of their operations, even though facing new problems of inadequacy of materials, changing forces and other developments of disturbed wartime conditions. As never before, this is a war of transportation and for this reason transportation must function at its highest possible efficiency. This is the greatest contribution that any man in railway service can make to the winning of the war. It constitutes a challenge to all-out effort from every maintenance of way officer and employee—and all records made to date insure that they will continue, not only to do their full part, but more.

Heat Cramps—

What They Are, How to Prevent Them

PERSONS exposed to high temperatures for prolonged periods may suffer from either heat prostration or sunstroke. Sunstroke is dependent, however, upon the direct action of the sun's rays in creating a disturbance in the heat regulating mechanism of the brain, and should not be confused with heat prostration. In sunstroke, treatment is urgent and a physican should be called immediately.

Heat prostration, known variously as heat exhaustion, heat fag, heat cramps and the bends, develops in persons exposed to excessive external heat, particularly if the humidity is high, while exerting considerable muscular effort. It may develop suddenly or come on gradually. In the first event, the patient will show signs of collapse and will suffer from severe cramping pains in the legs, arms and abdomen. Where the symptoms develop slowly, or the attack is mild, the first signs are a loss of energy, increased fatigue, a general let-down in effort and a tendency to do things the wrong way. If the attack progresses, as it will unless treatment is given, these symptoms are followed by a feeling of nausea and weakness, then by dizziness, a mild stupor and rapid pulse and respiration. Later the muscular cramps appear.

Fortunately, the remedy is simple and easily applied. Loss of salt through excessive or long continued perspiration is the principal cause of heat prostration. In mild cases or in the early stages of those that come on slowly, restoration of the salt lost from the tissues is all that is required, and even in severe cases prompt relief can be obtained by intravenous injections of a salt solution. In less severe cases the salt can be administered by means of salt tablets, which are readily available, or by drinking water in which salt has been dissolved. After an attack the patient should be kept quiet and on a strictly milk diet for 24 hours.

While heat prostrations do not occur so frequently among maintenance of way employees as among those in shops, enginehouses and power houses, they are common enough to make preventive measures desirable. Fortunately, these are also simple, for heat prostration can be avoided if a salt tablet is taken with each drink of water. Few roads make this mandatory as yet, but many require the stores department to carry them in stock so that they can be obtained promptly on regular supply requisitions. Maintenance officers are warranted in giving this subject increasing attention as we enter the summer period. There should be no excuse for heat prostrations in maintenance of way work at any time, especially in the months ahead, when the war effort of the railways demands the best efforts of every employee.

Resourcefulness—

May Be Needed in the Months Ahead

IN FORMER years it was not an unusual comment that the best wrecking foremen were to be found on branch lines and on those roads that were struggling for existence, partly because they got more practice, but principally because they had so little to do with that they were compelled to exercise their ingenuity until they became unusually proficient in their appointed tasks. Likewise, many high-grade trackmen, who were exceptionally resourceful and who were particularly dependable in emergencies, were developed in the same way, some of whom were later advanced to positions of high responsibility.

This does not imply that it was only on these roads that the most capable men were developed, but rather that unusual resourcefulness resulted from the necessity for keeping the tracks, the bridges and the buildings in serviceable condition, despite chronic stringencies in materials and equipment. In recent years, materials have not only been more plentiful, but also of higher quality than those of 30 or 40 years ago, while during the last quarter century the maintenance forces have had at their command a constantly growing list of power equipment to assist in the various phases of their work.

Although funds were curtailed sharply during the depression, there was no such lack of materials needed for the upkeep of the property as was so much in evidence on some roads three or four decades ago. Furthermore, with the start of the depression there was an immediate,

although temporary, surplus of work equipment of all the types then available. Again, new methods that tended to conserve both materials and labor were developed to ease the burdens that many of their predecessors had borne. Thus, while every maintenance officer felt the pinch of sharply-reduced appropriations, some more severely than others, and many were thrown heavily on their own resources, none were compelled to resort to the expedients that were often forced on the earlier generation.

We are again in a period when few materials required in maintenance can be obtained in abundance, while acute shortages exist in many. The maintenance department is not going to have a pleasant time in the next few months or years, because increasing difficulties in filling its needs will be accompanied by demands for higher standards of work. On the other hand, maintenance officers have at their command more varieties and units of work equipment than ever before. Track and bridges are stronger and better able to withstand the wear and tear of traffic, and almost all maintenance practices and standards are well in advance of those of only a few years ago.

Nevertheless, it will doubtless occur in some cases that these officers will be confronted with serious obstacles to the successful prosecution of their work, despite the better materials in service. Yet, the men in this department have heretofore been able to meet every emergency that has arisen, and there is no reason to believe that they will not continue to do so, whatever difficulties await them. Whatever may develop, they will be stronger and more resourceful for the experience.

Blackouts—

Railway Men Must Watch Developments

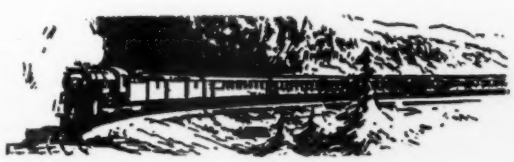
AS pointed out in the leading article in this issue, the railways are keenly aware of their responsibilities in the matter of air-raid precautions, and blackouts in particular, and many of them have taken steps to black out their properties in strategic areas to a remarkably effective degree. However, much as has been done, the problems presented by blackouts are new problems to railway men and promise to present serious difficulties and costly errors, if not approached on a most scientific and realistic basis. In fact, there are few in the country outside the railway industry, civilian or military, who know all of the answers to the blackout problem, careful study of English methods to the contrary, as is evidenced by the fact that new theories and practices are being constantly developed that are gradually changing, if not upsetting, earlier ideas. This situation should not be overlooked by maintenance of way and structures men, who are so directly involved in the measures that must be taken by the railways.

One of the most serious phases of the blackout for the railways is that, to prevent the demoralization of civilian, industrial and military life which demoralization is one of the principal objectives of enemy air raids, the railways must continue to load, unload and operate trains during blackouts with the maximum degree of safety possible. To do this requires light—light that is invisible from bombing plane altitudes, and yet of a quality and intensity adequate to the immediate needs of safe ground operations. This consideration, plus certain general civilian considerations, is giving increased credance to the dimout theory, in contrast to total blackout as originally conceived—a fundamental change. In fact, there have been changes all along the line, some of the earlier measures considered having proved more hazardous to safety than air raids themselves. Today, there is a growing concept that in the interest of efficiency and safety, illumination should be curtailed as little as is consistent with obscuring objectives and confusing enemy airmen. Incidentally, blue light, quickly adopted by certain communities and some railroads to effect dimmed lighting, has been proved less effective than dimmed red light of the same intensity. Many have overlooked the fact that the blacking out of building windows must be accompanied by adequate ventilation, and that the means adopted cannot be allowed to destroy or disrupt the effectiveness of daylight operations.

With these changes in blackout fundamentals and means of effecting them with the least interference with necessary operations, are coming many developments in blackout lighting bulbs, in protecting screens and hoods, in the use of phosphorescent paint and other luminous materials for safety lanes, warnings, directional signs, etc., all of which emphasize the fact that blackout methods, especially as applied to the railways, are still in a state of flux. In view of this situation, and the rules and regulations that are certain to be promulgated for the railways as the art of blackout or dimout is further developed, it would be well for maintenance of way and structures men outside of critical areas where definite rules and orders are already in effect, to confine their efforts at blackout precautions to a careful study of their local conditions and of all developments in the art that might effect them when actual blackout precaution orders come.

As mentioned in the article in this issue, the Association of American Railroads has a special committee working specifically on the blackout problems of the railways. When this committee's recommendations are made, which presumably will give consideration to all of the latest developments in blackout methods and procedures as they affect the railways, will be time enough for those railways outside of critical areas to adopt blackout or dimout measures of other than a general nature. To follow any other course is certain to entail major adjustments in steps already taken, with confusion, if not sizable economic waste.

Therefore, a self-imposed blackout curb by maintenance men on themselves would appear to be in order, until and unless orders to the contrary are issued by properly delegated authorities. At the same time, they might well attempt to curb over-zealous community blackout authorities, who might otherwise seriously complicate or confuse the situation by failure to see or inability to understand the railway problem as a whole.



Blackouts—Maintenance

Railways, individually and collectively, study the problem of how to blot from enemy airmen the guiding pattern of arteries of rail transportation. This article, based on a survey of the situation along the East and West coasts, cites some of the problems presented to maintenance men, and points out some of the measures that are being taken on various roads to darken buildings, obscure switch lamps, etc.

IN the extensive air-raid precautions that are being developed aind adopted throughout the country, and especially along our coastal areas, in the fear of "token" or sustained air raids, the railways have a highly important part to play, both from the standpoint of obscuring their properties and operations from possible enemy airmen as a means of self-protection, and of blotting from view their lines and other facilities which might otherwise act as a guide to the enemy in his search for cities, industrial areas or vital defense zones. In addition, the railways, on whose shoulders now rests the major part of the burden of our war transportation, must be prepared to make rapid repairs to any of their facilities that might be damaged by actual bombing raids. In all of these various phases of adequate air-raid precautions, maintenance of way and structures men are assuming a most important part, and while each phase presents special and difficult problems, the phase that is proving most difficult of satisfactory solution, being entirely new to the railroads, is that of the blackout itself.

When the railroads were first confronted with the blackout problem, their only source of help was a publication entitled "Blackouts," prepared by the War department for the Office of Civilian Defense. This book sets forth the general requirements for blackouts and describes in detail, with the help of photographs and drawings, the manner in which various types of structures can be blacked out. It includes a chapter on transportation, which lays down certain rules for the treatment of various types of railroad lighting, but these rules are only of a general nature, and no attempt is made to specify the exact manner in which the various sources of light peculiar to railroad operations are to be obscured. That the book recognizes, however, the importance of the railways in any blackout plan, is seen in one statement included which says that, "Inasmuch as types and routes of transportation may have very definite light patterns in each vital area, special attention must be paid to seeing that their blackout provisions are fully co-ordinated with the general plans for the area as a whole. Negligence or other errors in co-operation by one transport agency might be far worse than many mistakes made by individuals, or even by many small areas."

Railroads Are Co-operating

As far as the railways in vital areas are concerned, the foregoing statement can mean only one thing—the hooding, screening, dimming or otherwise obscuring or obliterating during blackouts of the lights of trains, roadside signals, terminals, stations, shops and other structures so as to deprive enemy airmen of a pattern that would lead them to their most desired objectives. Accordingly, and in the fullest spirit of co-operation, the railways, both individually and collectively, are working closely with the various branches of the military and with civilian defense organizations, to avoid displaying any pattern that would give aid to the enemy. Throughout their efforts, however, they have maintained that train operation must continue during blackout periods, contending that, otherwise, every air-raid scare would serve the enemy effectively by slowing down or bringing railway operations to a standstill. To avoid confusion also, which was actually experienced during early blackout trials along both the East and West Coasts, the railways have also contended for national or regional control of blackout requirements, without the interference of local or state rules and regulations.

In a co-ordinated effort to determine the manner in which the railways can best black-out their properties, and to set up recommended practices regarding specific methods and devices, the Association of American Railroads organized a special blackout committee several months ago, which committee is still at work, with the hope of making a report at an early date, based on extensive studies and tests. While awaiting the recommendations of this committee, most of the railroads serving the East and West coasts, acting upon the urgent request or requirements of the Office of Civilian Defense or the War and Navy departments, have found it necessary to take at least some individual action toward blackout preparations, and in perfecting air-raid precautions in general. In fact, even roads in the Central West have set up air-raid organizations and have taken steps to permit at least partial blackout of their facilities when called upon to do so.

The three principal problems presented to the railways during air-raid alerts or blackouts are to obscure from overhead view train operations,

# of Way and Structures Men

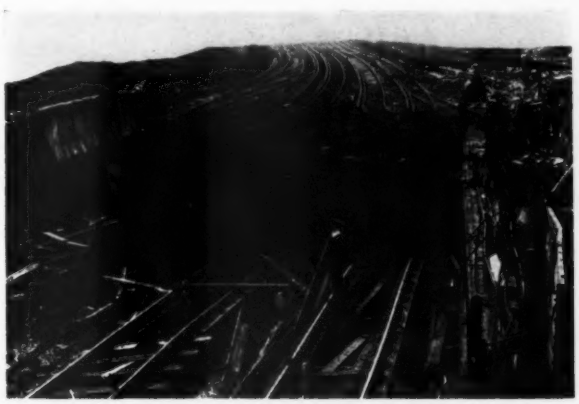
Have Important Part to Play

wayside and yard signals, and their scattered thousands of buildings of one type or another. Of these, no one can be said to be of greater importance than another, but since the problems of maintenance of way and structures men have to do more directly with the blacking out of building and switch lights, leaving the problems of train and signals to the operating and signal departments, the remainder of this article will deal primarily with building and switch lights. It should be said, however, that both the operating and signal departments of the railways are keenly alert to their specific problems, and that on a number of roads definite measures have already been taken to blackout all interior train lighting, and to hood, dim, or otherwise obscure exterior train lights and all signal lights during official blackout periods—without interfering with train operation.

The Building Problem

Since the principles involved in the blacking out of buildings generally, as pointed out in the War department's publication on blackouts, are applicable to many, if not most railroad structures, substantial progress has been made on some roads in perfecting plans for blacking out their buildings, particularly those which are subject to night operations which cannot be interrupted without affecting train operation or other important work. At locations where night employment is not regular, the requirements for blackout are being met usually by extinguishing all lights and by stopping work during blackout periods. In addition, some roads have also built up complete emergency organizations, including air-raid wardens, fire-fighting brigades and first-aid staffs. Some even considered the setting up of system-wide standards for blacking out their facilities, but civilian defense authorities have generally questioned the practicability or necessity for such measures, pointing out that blackout and other air-raid precautions may vary widely at different points on the same railroad, as, for instance, along exposed coastal areas or in or about industrial areas, as compared with more inland areas free from facilities with any military or industrial aspect.

The manner in which buildings are being blacked out on some roads is well illustrated in the methods being employed on one road where plans for air-raid precautions are far advanced.



A Direct Bomb Hit Caused the Collapse of This Girder Bridge Carrying the Tracks of the Southern Railway of England across a Public Road

(This and Accompanying Photographs Were Furnished Through the Courtesy of the New York City Office of the Associated British and Irish Railways, Inc.)

Scene at a Passenger Station of the Great Western of England Following an Air Raid

On this road, the practice in general is to provide some form of covering for the windows of offices and other buildings that must be in use 24 hours a day, and simply to switch off the lights in buildings where it is not absolutely necessary that operations be continued during blackout periods. To permit employees and patrons to find their way about darkened buildings, colored incandescent lamps, giving only a faint light that is invisible from the exterior, have been installed in corridors, passageways, stairways, waiting rooms and similar places.

On this same road, instructions have been issued to govern the conduct of employees during air-raid warnings to the end that doors and windows in blacked-out structures will not be opened and that light from other sources will not be displayed. The method to be used in covering the windows of buildings to be blacked out, that is, whether by paint, cloth or other material, depends on local conditions, and, to a large extent, is left to the discretion of the division forces. In offices and other buildings that are not generally lighted at night, but where there is a possibility that lights might be turned on during the hours of darkness, employees are required to draw the window shades before leaving for the day.

This Pile of Debris Was What Was Left of a Station of the London, Midland & Scottish Railway Following an Air Raid

Luminous Directional Signs

The special blackout planning that is being done by a number of roads at their more important buildings is evidenced clearly in the measures taken at a large passenger station and office building of the above road in a large metropolitan area. Here, in addition to the blackout measures described above, the precautions taken include the designation of places of relative safety to which patrons will be directed during blackouts, and the provision of directional signs, painted with luminous paint, to indicate in darkness the way to these points of safety. As a further part of the air-raid precautions that have been taken at this particular station, an organization of company personnel has been developed to "take over" during blackouts, which consists of air-raid wardens, a fire-fighting brigade and a first-aid staff. Also, all fire-fighting equipment at the station has been overhauled, and additional equipment, including special types needed for extinguishing incendiary bombs, has been provided. Finally, it is planned to install a "howler" air-raid warning system.

Railroad men generally appreciate the importance of obscuring building lights during blackout periods, but, as has been indicated, there is a wide diversity of opinion as to what means of window protection should be employed, or, in fact, whether any form of window protection is necessary if the interior lights are properly subdued and are so screened or shielded as to prevent any direct light rays from passing out the windows. Such approved lights are now available, and where they can be used, they are being considered by some as preferable to various means of shading windows.

Where normal interior lighting is essential to work operations, it is obvious that window shading must be resorted to, and, as already pointed out, different methods are being employed, all the way from black paint, where permanent darkness is permissible, to rigid forms of window protection, such as plywood or wallboard panels, which will afford a substantial measure of protection against flying glass in the event that windows are shattered. For windows where this factor is not of importance, there are those who recommend the most economical form of window shade adequate to the situation, pointing out that these can be quickly drawn to effect a blackout, and raised equally as fast to permit normal daylight operations. In all cases, it is being considered essential that adequate ventilation of building areas be permitted during blackout periods.

Terminals a Special Problem

Effecting blackouts at passenger terminals and the handling of passengers, mail, baggage and express at the larger stations, have not as yet been solved in an entirely satisfactory manner, either from the standpoint of lighting or the handling of trains. In fact, in some areas, local instructions for blackout observance prevent the movement of vehicular traffic in the city streets, and, consequently make it impossible for passengers, as well as baggage, mail and express, to reach passenger stations during blackouts. Where this condition prevails, making it inadvisable for trains to depart, station facilities are being completely darkened by shutting off all illumination. Generally speaking, however, the plan is to keep trains moving on as nearly a normal basis as possible. This plan gives recognition to the fact that one of the primary purposes of enemy air raids is to demoralize the normal life of the community, and that this objective can be defeated only by carrying on with essential transportation services to the fullest possible extent.

So far as commuter service is concerned, one road, which carries a heavy commuter business into and out of a large metropolitan area, has tentatively decided that, in the event of an air-raid alert during the morning rush hours, all incoming trains will be stopped wherever they may happen to be. However, if the alert should be sounded during the evening rush hours, outgoing trains will be operated as nearly on schedule as possible, this plan being based on the theory that to bring passengers into a terminal point under raid conditions would be hazardous, while to rush them out of a raid area would be in the interest of greatest safety.

With increasing acceptance of the dim-out theory of obscuring facilities, some roads, with the encouragement of authorities, are giving consideration to the installation of dim, hooded lights at terminals, which, while invisible except from directly beneath, and far from adequate to permit normal operations, will allow the cautious movement of passengers and employees about platforms, both in train loading and unloading operations. Furthermore, another protective

(Continued on page 416)

Our Part In The War Effort

Addressing the Maintenance of Way Club of Chicago on April 27, Mr. Budd points to shortages ahead in labor, equipment and materials—urges that the needs of the railways be not overlooked—and tells maintenance men that they must do the best they can with what they have

By RALPH BUDD
President
Chicago, Burlington & Quincy

ALL railroad men, regardless of department, now have only one primary objective, and that is to do each day the tasks that will contribute most to the winning of the war. The railroads have a very just cause for pride in our contribution thus far. They have surprised almost everyone. Sometimes I think they have surprised themselves. When we look at the record of what the roads actually did in 1941, it is a truly admirable record.

We had an average of 1,675,000 railroad-owned freight cars in 1941, or about 70 per cent of the 2,300,000 that we owned in 1929. Last year we handled about 80 per cent as many carloads as in 1929, and yet the average haul was so much greater in 1941 and the average loadings were so much heavier that we produced about 5 per cent more ton-miles—a great performance, and one for which all who contributed to it should be proud.

Must Have Needed Materials

I do not believe that we know yet how much traffic the railroads can handle if they are given what they need. These needs are, however, of extreme importance. One of them is that they be supplied with enough materials. Our tracks, cars and locomotives were pretty much in balance with the requirements of transportation when our war effort began. Now, as the productive capacity of the country increases and the transportation demands resulting from the transfer of freight and passengers from other carriers to the railroads further increase our load, we must increase our capacity. Part of that increase will be in new locomotives, part of it in new cars, and part of it will be in improvements in our fixed properties. It is now, as it has always been, very difficult to get a reliable estimate of what our future requirements will be. We do know, however, that throughout 1941 all of the raw materials and most other commodities that could be produced were being produced and moving—so we had "all-out" production.

Changes that are now taking place again make it very difficult to estimate accurately what the future demand will be. These changes are arising because we are at war, resulting in many diversions from other forms of transportation to the railroads. We are now moving a great deal of material transcontinentally and handling a substantial tonnage of oil and coal formerly moved by intracoastal ships. Furthermore, a largely increased percentage of the total volume of traffic in this country is now being handled for the war department and under war conditions, and an increasingly large percentage of the cars that are now being loaded and moved for our war effort are not subject to the same voluntary quick turn that we get from shippers.

Supply Cut Serious

We are now faced with a very serious difficulty as regards material. I left Washington on January 2 of this year. The last thing I did there, on New Year's Day, was to go with Mr. Eastman, at his request, to a meeting with the Supply Priorities and Allocation Board, the authority which at that time controlled the distribution of materials. I presented the problem at Mr. Eastman's request, because he had not yet taken hold of his job. I asked this Board to permit a continuation of the car and locomotive building programs at an accelerated pace. We were then producing about 9,000 cars a month, and I argued with the Board that the only safe course to pursue was to step that up as rapidly as possible to 12,500 cars. As a result of that meeting, they authorized that 36,000 freight cars could be built during February, March and April; that would have left us in a position to continue until we had built about 150,000 cars during the year. Instead of carrying out this recommendation, the War Production Board, successor of the S.P.A.B., reduced the number of cars which are to be built during the remainder of the year to 18,000. This is equivalent to the average number of cars retired through wear, tear and other causes.

Now as to track materials. We asked for 1,620,000 tons of new rails. This was cut down to 1,250,000 tons, and it looks now as though we will have great difficulty in getting even this allocation. Second-hand rail is quite a problem. The tendency of the War department has been to write specifications for tracks to be built on Government reservations, based on railroad standards for new main lines. It has been quite a task to educate those responsible for the design and specifications to the idea that the whole war effort would be served better by building the kind of railroads in these plants that would meet the needs of an industry, that is, employing second-hand rail, and thereby allowing new rail to go to the railroads for their main line tracks. This objective has not yet been accomplished fully, but it is more nearly the adopted practice now than before. If the railroads are able to furnish the second-hand rail, I think there will be no further difficulty in carrying out that plan.

Needs Must Be Respected

It is the duty of all of us to do everything that we possibly can to co-operate with Mr. Eastman in his position of trying to secure for the railroads their needs in order that they can make the best contribution to the war effort. I have been of the opinion that the War Production Board should have a representative of transportation sitting with them in their deliberations. Transportation was not considered a part of the formal war effort, but apart from it. Mr. Eastman is given the duty under the President's executive order to say what the railroads need, and the greatest contribution that he can make is to see that those needs are taken care of.

I agree with Mr. Eastman that we must not give up, but must continue to try to secure the materials that we need in order that we can make the greatest possible contribution to the war effort. In the end, however, whether we get one-fourth or one-fifth or one-half of what we need, we are going to do the very best we can with what we have. To accomplish that result, you will have to use the greatest ingenuity in every phase of your work because the ton-miles ahead

(Continued on page 416)

Beating A Bridge Burn-

Looking East (Toward the Shore) of the Approach Trestle During the Fire. Kinked Rails Attest the Intensity of the Heat

LATE one Saturday afternoon last year, the bridge tender at a four-track main-line drawbridge of the Boston & Maine at Boston observed smoke pouring from the deck of a 330-ft. pile-trestle approach to the structure. Although he spread the alarm immediately, and strenuous attempts were made to curb the blaze, it succeeded in destroying much of the deck of the structure to a level just below the undersides of the caps. However, the fire had hardly been discovered before the company began rallying its forces for reconstruction, and so efficiently was the restoration work organized and prosecuted, that a train was operated over the bridge on a single-track trestle under complete signal protection 37 hr. and 17 min. after the flames were first discovered, although, if circumstances had required, it would have been possible to restore single-track operation about 8 hr. sooner.

A Key Bridge

The bridge involved in this fire, known as Drawbridge No. 8, spans the Mystic river at Boston about two miles north of the North Station, where it carries the most westerly of this company's two main lines between Boston and Portland, Me. The other main line between these points is also carried across the Mystic river, a tide-water stream at this point, on a drawspan located somewhat to the south of Drawbridge 8.

The structure involves a drawspan of the jack-knife type which is flanked on both sides by timber-pile approach trestles, that on the east side comprising about 30 spans, and being about 330 ft. long, and that on the west having about 20 spans. The spans in the bridge range in length from 10 ft. 6 in. to 12 ft. 6 in., and there are 21 piles in each bent. The piles are of untreated oak, and it was estimated at the time of the fire that they would last another eight or ten years.

Prior to the fire each bent had two 6-in. by 12-in. girder caps mortised into the tops of the piles, which were surmounted by a 6-in. by 16-in. rider cap. There were two 12-in. by 16-in. stringers, butted at the bents, under each rail, about 25 per cent of which were of creosoted material. None of the other material in the old bridge was treated.

Of the four tracks on the bridge, that on the upstream or northerly side is largely a freight track, and is known as the Medford track. Proceeding across the bridge from this side, the other tracks are, successively, the westbound passenger main, the eastbound passenger main, and a working track, known as the Boulevard track.

The fire occurred in the east approach trestle, on a Saturday, being discovered by the drawbridge operator at 3:55 p.m. Of undetermined origin, the fire started near the westerly end of the approach, that is, at the end nearest the drawspan. A number of fire departments from towns and suburbs in the immediate vicinity responded to the alarm, and a fire boat was also dispatched to the scene by the city of Boston. However, at the time the fire occurred, the river was at half-tide and, since it is relatively shallow in the vicinity of the bridge, the fire boat had difficulty in maneuvering into a position sufficiently close to the bridge to be able to lend effective aid.

Extent of Damage

In spite of the combined efforts of these various agencies, the fire spread eastward along the approach, and also laterally, until it had engulfed nearly the entire deck of the approach as well as the super-structure of the drawbridge. By 5:30 p.m., however, the fire had been subdued sufficiently to permit an inspection to be made for the purpose of determining the extent of the damage, and of planning a method of attack on the problem of restoration. In this inspection, it was disclosed that the only part of the deck that was still fit for service was three rail lengths at the west end under the Medford track and one rail length at the east end of the same track.

The problem presented was that of getting at least one track across the bridge back into service as quickly as possible, and certainly by an early hour on Monday in order that it would be possible to handle the morning commuter traffic. The decision was made to restore the Medford track first by cutting off the piles at a level 6 in. below the undersides of the girder caps and then capping each bent with two 12-in. by 12-in. pieces —thereby bringing it up to the level of the top of the original rider cap. Timber stringers were then to be applied in the same butt arrangement as previously. In a few cases the piles were damaged to a point somewhat below the cut-off level, and in these instances pieces of the necessary length were spliced to the piles to bring them up to the desired level.

By 7:30 p.m. the day of the fire, lists had been completed of the material that would be required for the work of restoring the trestle under the Medford track. These lists were

Out on the B. & M.

When one of the four-track pile-trestle approaches of an important main-line drawbridge on the Boston & Maine was damaged severely by fire last year, the railroad's forces, quickly organized into a smoothly-operating machine of reconstruction, restored single-track operation over the structure in 37 hr. 17 mi. This article relates in detail the manner in which the reconstruction work was carried out

handed to the company's traveling storekeeper at Boston for transmission by telephone to its timber yard and treating plant at Nashua, N. H. This plant had previously been advised of the emergency and had been instructed to assemble men for loading cars and also to get the necessary cars ready for loading. Similar instructions were also issued to a local concern at Boston that was to supply the hardware required for the reconstruction work. By 1:30 a.m. Sunday, four cars of material were on their way to the scene of the emergency from Nashua, a through freight train having been stopped at that point to pick up these cars. They arrived at the bridge site at 4:00 a.m. Sunday. However, using material available locally, the work of restoration was well under way at the time that these cars arrived.

While these steps were being taken to assure a supply of material for restoring the one track, the work of assembling the necessary men and equipment also went forward. The fact that the fire occurred on a Saturday afternoon was fortunate to the extent that, the next day being Sunday, there would be no commuter traffic to handle. However, there was also an unfortunate aspect, for at the time the fire occurred many employees of the company who would be required in the restoration work had departed for the weekend.

Organization

The work of assembling the necessary forces for reconstruction began almost immediately after the fire was discovered. For this purpose the railroad made use of the regular organization that it maintains for assembling the emergency forces that are required in instances such as this. This organization had soon made contact with the foremen of the various bridge and track gangs that would be required, who in turn undertook to get in touch with the members of their individual gangs. In the meantime, the division superintendent and the trainmaster had appeared on the scene and were bending their efforts to the work of furnishing the necessary locomotives and crews for switching material cars at the bridge.

The bridge forces that were assembled at the site of the work included 10 bridge carpenter crews, one bridge and building labor gang, and the necessary mechanics and crane operators, comprising a total of about 175 men. These included 3 foremen and 35 men who were brought to the bridge site from the Portland and New Hampshire divisions. These men arrived in two camp-car outfits, which, together with a similar outfit from the Terminal division (Boston), were brought into service for feeding the emergency crews throughout the course of the work. These outfits were ready for operation by Sunday noon. The number of bridge men employed in this work was matched by approximately an equal force of track

This View of the Fire Was Taken As It Was Still Gaining Force. Note the Drawbridge Tower in the Immediate Background

men who were needed for making the various track changes that became necessary as the restoration work progressed through its various stages.

In spite of the fact that they were so widely scattered at the time of the fire, about one-third of these forces had been assembled by midnight Saturday, and the remainder were on the job by 8 o'clock Sunday morning. Meanwhile, the necessary material-handling and other power equipment was being assembled. Among the equipment needed was a track-mounted crane for handling material at the east end of the bridge. The nearest available crane suitable for this type of work was located at Salem, Mass., a point on the easterly main line between Boston and Portland about 16 miles east of Boston. To expedite the delivery of this crane to the job, the engine on an eastbound (to Portland) freight train was detached from its train at Salem and used to transport the crane to the bridge site. About 9 o'clock Saturday night, this crane was put to work clearing charred material from as much of the deck as could be reached from the east end.

It happened that for a distance of about five rail lengths from the east end of the structure, the deck under the westbound track, adjacent to the Medford track, while seriously weakened, was still capable of supporting the weight of the crane, a gas-powered unit. This circumstance made it possible for the machine to move out onto the bridge for a considerable distance in stripping material from the adjacent Medford track. Later during the operations, a lighter carrying a derrick was also employed in ripping out and removing the charred bridge material.

Reconstruction Started

The actual work of reconstructing the deck under the Medford track got under way at 6 o'clock Sunday morning when the work of cutting off the tops of the piles was commenced. Shortly thereafter the repair operations were in full swing. Materials for the repair work were delivered at the west end of the bridge, where they were unloaded by steam locomotive cranes. Here the pieces were framed as necessary and then loaded on a lighter, by means of which they were floated across the river, being handled into position by the crane operating on that side.

All of the timber employed in the reconstruction of the Medford track, including the ties, was untreated, much of it second-hand. As delivered at the bridge, the ties were of the required length, but the cap members and stringers were in random lengths and were cut to size at the site, this work being done at the west end of the bridge.

Other than the several cranes that were used, the power equipment that was assembled on this job included two air compressors, one an eight-tool tie-tamper unit that was used in the framing work at the west end, and the other a 12-tool machine which was used to operate tools that were employed on the bridge proper. Some of the work of cutting the caps and stringers to length was performed with an air-operated chain saw, but for the most part this work was done by hand. Also, all piles were cut off by hand. On the other hand, all the bolt holes required were bored by air-operated augers.

To permit the emergency repair operations to go forward at night, the site was amply illuminated by flood lights. A transformer was cut in to a nearby power line to furnish power for some of these lights. Also, three portable generators were provided, two of which were 3-kw. units while the other had a capacity of 5-kw.

First Track Restored

By 7 o'clock Sunday night the work of reconstructing the trestle deck under the Medford track had been substantially completed, although a certain amount of track work remained to be done. By 9 o'clock that evening, or 29 hr. 5 min. after the fire was discovered, it would have been possible to operate trains over the bridge, although, as stated at the outset, the first train did not pass over the trestle until 5:12 a.m. Monday.

During Sunday it was decided to reconstruct the remainder of the trestle approach on a permanent basis and to employ the lap-chord form of arrangement for the stringers, using treated material. The reasoning in this connection was that the use of this type of construction would make it possible to salvage the stringers when the substructure should be renewed at some later time. Incidentally, this represents the first instance in which the lap arrangement for stringers has been employed on this road.

After the Medford track, the next to be reconstructed was the eastbound track. Material for this track was ordered on Sunday, being cut to length, framed and treated and delivered to the bridge by Tuesday morning. Meanwhile, the work of removing the remainder of the old deck material was undertaken at about 11:00 p.m. Sunday and, while waiting for the material for the second track to arrive, the work of cutting off the piles under this track was carried out. The eastbound track was returned to service at 5 o'clock on Wednesday morning, 85 hr. 5 min. after the fire was discovered. Up to this point, the emergency crews engaged in the reconstruction of the bridge had been organized into two shifts of 12 hr. each. After the eastbound track had been restored to service, the night shift was discontinued.

The structure under the westbound track was the next part of the bridge to be reconstructed. When traffic conditions permitted during this part of the work, traffic was single-tracked over the Medford track so that the eastbound track would be available for use in handling materials and for other purposes in connection with the reconstruction work. The westbound track was restored to service at 5:00 a.m. on the following Saturday. Thus, in about 11 hr. less than a week, three of the tracks on the bridge had been returned to service, two of which had been reconstructed on a permanent basis.

Reconstruction Completed

Twelve days after the fire, the Boulevard track was placed in service, thereby marking the practical completion of the restoration work. However, as it existed at this stage, the approach was comprised actually of four separate trestles. To tie the structure together into an integral unit, two continuous horizontal girts, comprised of 6-in. by 12-in. treated members, were applied near the top of each bent, one on each side.

The timber tower and operating machinery of the drawspan for this bridge, which is located at the outer end of the easterly approach, was severly damaged during the fire, although the drawspan itself remained intact in the closed position. Shortly after the fire, therefore, the tower was replaced, using treated timber. At the same time the timber substructure of the tower was also renewed.

The emergency reconstruction work described in this article was carried out under the general direction of the late W. F. Cummings, then chief engineer, H. F. Fifield, engineer maintenance of way, and J. P. Muller, engineer signals and telegraph, and under the direct supervision of S. G. Phillips, then division engineer of the Terminal division, and now engineer maintenance of way of the Maine Central and Portland Terminal; H. W. Legro, then assistant division engineer of the Terminal division, and now engineer of grade crossings; F. R. Spofford, bridge and building supervisor; and J. F. Talbot, track supervisor.

Locomotive Tenders of 24,000 Gal. Capacity and Water Delivery Rates from 3,500 to 5,500 Gal. Per Min., Are Now Required on Many Roads

The factors that must be given consideration if the maximum practicable rate of water is to be obtained at any given location are discussed in this abstract of a report that was presented at the annual convention of the American Railway Engineering Association in March*

What Size Water Columns and Supply Lines?

THE fast passenger and freight train schedules that prevail today on American railroads are being achieved by increased speeds, lengthened runs between stops for water and by reducing the time required for such stops. It is in the latter connection that the problem of water delivery to locomotive tenders has become extremely important during the past few years, and in many cases improvements have been inaugurated to reduce the time required to deliver water to locomotives at terminals and intermediate points.

Under the new conditions, tender capacities of 7,000 to 12,000 gal. and the delivery rate of 1,500 gal. per min. are no longer considered satisfactory. Locomotive tenders of 24,000 gal. capacity and water-delivery rates of 3,500 to 5,500 gal. are now required. On many railroads the limitations of small-capacity tenders have been overcome by introducing auxiliary tenders consisting of water tank cars.

*Presented by a subcommittee of the Committee on Water Service, Fire Protection & Sanitation, of which H. E. Silcox, assistant engineer water supply, Chesapeake & Ohio, was chairman.

The delivery rate of a water column is contingent on the following factors: (a) The size, length and condition of the supply pipe line; (b) the flow head of the storage tank above the water-column outlet; (c) the size of the storage tank; and (d) the type and design of the water column. As an illustration of the effect of the size of the supply line, the flow head as shown on hydraulic charts indicates that the friction loss in a 16-in. supply line is only one-tenth of that in an equivalent length of 10-in. pipe The use of storage tanks with the largest practicable capacities per foot of height should be considered to the end that maximum flow heads will be maintained and insure maintenance of maximum uniform delivery rates.

Results of Questionnaire

To obtain representative data covering present and proposed practices, a questionnaire was submitted to 32 railroads. An analysis of the replies received indicates that the railroads have given scant attention to the selection of the type and design of water columns and the size of supply lines. The replies to the questionnaire may be summarized as follows:

Average flow head above water-column outlet	25 ft.
Maximum flow head above water-column outlet	
Using storage tank supply	104 ft.
Using city water main supply	231 ft.
Average water-column delivery	2,500 g.p.m.
Maximum water-Column delivery	5,500 g.p.m.
Locomotive tender capacities	14,000 to 25,000 gal.

The most common source of water supply for columns is the storage tank, with delivery being made through a pipe line that is designed to give a maximum discharge with the available flow head. In other cases, connections are made to city water mains (which are permitted by only a few

municipalities), or large-capacity electric pumps with control equipment are installed to deliver water directly from the sources of supply to the columns. Many supply systems are such that it is impractical to increase the flow head on the water column or to increase the size of the line to secure a higher rate of delivery. In such cases the delivery can be increased as much as 150 per cent by the installation of a loop, or dual, supply line, or by installing a storage tank near the point of delivery. In the older supply systems, the rates of delivery often fall off because of incrustation in the pipe lines and water columns. In such instances, the removal of the encrusting matter has in many cases increased the delivery rates as much as 90 to 125 per cent, and restored the lines to practically their original carrying capacities.

A method of increasing the supply-line delivery rate where the flow head is low is to install a large-capacity electric motor-driven booster pump in the line, which will start automatically when the water-column valve is opened. Such installations are expensive to install and operate, and only one has been reported as being used. In new or reconstructed installations, the storage tank or tanks should be so located as to provide for the shortest possible length of water-column supply line.

High Rates Present Problems

Under present operating conditions, it is necessary to deliver water to locomotive tenders with cistern openings that are from 9 ft. 6 in. to 13 ft. 6 in. above the top of rail. To cover this range, the modern water columns are equipped with curved goose-neck outlets and telescopic spouts. With the introduction of higher water-delivery rates, the force of the water has a tendency to kick the spout out of the cistern opening, thus presenting an appreciable hazard in handling the watering operation. This type of installation cannot be used with safety on the lower tenders if the delivery rate is high. Some roads use chains or a special locking device for holding the spout in place. However, observation indicates that the use of these anchoring devices consumes considerable time and causes train delays in the watering operation.

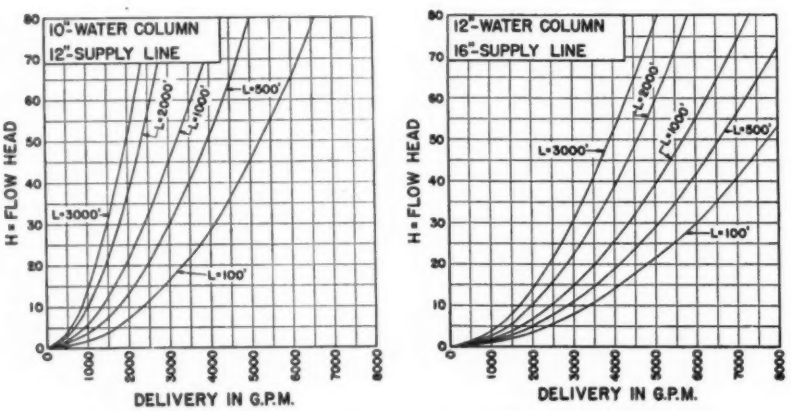
Special Valves Necessary

With the higher rates of water delivery, it is essential that the tender be vented by opening additional covers to permit the rapid release of entrapped air. This prevents surging and the possible wetting of the fireman. The discharge end of the spout should be of ample size to provide a free water outlet, thus avoiding backlashing.

In some cases involving high-velocity flows, the bucking of the column spout is so great that the throttling of the supply-line valve is necessary to permit the watering operation to be carried out safely. With the faster rates of water delivery, the sudden stoppage of flow brought about by valve closures ranging from 6 to 10 sec. is apt to cause water-hammer damage to the pipe line, and for this reason it is important that the column and supply line be equipped with an adequate slow-closing device or relief valves.

The recommended safe maximum water-column deliveries of the various railroads range from 3,000 to 5,500 gal. per min. However, with the use of improved equipment, it is believed that rates of 3,500 to 5,500 gal. per min. represent the practical maximum safe limits, depending on the range in height above the rail of the locomotive tenders to be watered.

In selecting the sizes of water columns and supply lines, no fixed rule can be established as there are too many variable conditions to be taken into consideration at individual locations. Each case needs separate study to obtain the desired results in the most economical manner.



These Charts Show the Delivery Rates, for Different Lengths of Pipe Lines, of Two Combinations of Water-Column and Supply-Line Sizes

Delivery Charts

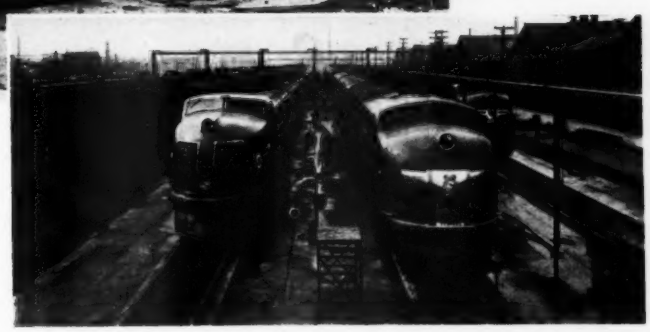
A number of graphic water-column delivery charts have been prepared as a guide in selecting the proper sizes of columns and supply lines to provide the desired water-delivery rates under various flow-head conditions, and are made a part of this report. The charts show delivery rates in gallons per minute for supply lines from 100 to 3,000 ft. in length for different combinations of water-column and supply-line sizes. [Two of the six charts presented with the report are included herewith, one showing delivery rates for a 10-in. water column with a 12-in. supply line, and the other of a 12-in. water column with a 16-in. supply line.—Ed.]

These charts take into consideration all of the hydraulic factors which enter into the functioning of a water-column delivery system. The flow-head, as used in the charts, is the vertical distance in feet between the level of the water in the storage tank and the point on the water column at which the spout is connected. In compiling the charts, allowance was made for the entrance head loss; the friction losses in three elbows, two gate valves, one reducer, and the pipe line; the head loss in the water column; and the velocity head loss. The water-delivery rates shown have been checked against actual performance. In addition to their value in planning new work, the charts will be of assistance in checking the performance of existing installations, as periodic delivery checks compared with the graphs will disclose pipe-line restrictions and other factors requiring attention to maintain full efficiency of the facilities.

Conclusions

When it is desired to increase the delivery rate of a water column the following possibilities should receive consideration: (a) Cleaning the existing supply line; (b) the installation of an auxiliary supply line forming a loop system; (c) increasing the size of the supply line serving the water column; (d) locating the storage tank as close to the water column as possible; (e) the use of larger water

(Continued on page 414)



Left—The New Incinerator, Built Largely of Second-Hand Materials. Below — General View of the New Streamliner Servicing Facilities

Garbage

No Problem at

This Streamliner Servicing Plant

Incinerator, built by Chicago & North Western, at Chicago, insures quick disposal of refuse

AS a part of its recently completed modern streamliner servicing facilities at Chicago, the Chicago & North Western has built a relatively simple, yet highly effective incinerator for the disposal of garbage and all other forms of waste from its streamlined trains, now including a total of nine, which are serviced at this point prior to turnaround runs to the Pacific coast, Denver, Colo., the Twin Cities and points in northern Wisconsin. From the standpoint of operation, the new incinerator is in keeping with the other modern elements of the servicing facilities and provides the greatest insurance against the nuisance of flies, mice and offensive odors that would otherwise be present to some extent if less effective disposal methods had been provided. From the standpoint of construction, the most interesting fact is that the incinerator plant was constructed almost entirely of second-hand or scrap material.

The incinerator, which is located at the extreme west end of the servicing layout, nearly 400 ft. from the near ends of the three long train inspection pits at this point, consists essentially of a scrap locomotive boiler, up-ended on a concrete foundation, together with a depressed concrete ash removal pit, suitable timber ramps leading to a platform at the firebox or charging level, and a stub-end service track alongside for the disposal into cars of ashes and other non-combustible refuse, such as food containers. Mounted on a horseshoe-shaped concrete footing, its center acting as an ash pit, the locomotive boiler extends to a height of 22 ft. above its fire level, and above this point is extended upward an additional 15 ft. for added draft by means of a steel stack, 30 in. in diameter, bolted to the smoke box.

In converting the old boiler into an incinerator, the old back flue sheet and flues were removed to afford an unobstructed smoke chamber, but the front end flue sheet was left in place to act as a spark arrester. The back head of the boiler was cut out and the old firebox area was fitted with two grates, one 2 ft. 4 in. above the other; the lower grate being used as the fire grate, and the upper one as the garbage burning grate. In addition, the former grate opening of the firebox, becoming the front face of the incinerator. was fitted with two ½-in. steel plate doors, one serving the fire grate, and the other, directly above, the garbage grate. The lower of these doors is 21 in. by 15 in. in area, while the upper one is 40 in. by 33 in.

Both of the grates of the incinerator are of the same general type, consisting of a series of inverted 65-lb. scrap rails, with their bases spaced 2 in. apart—the fire grate being made up of seven rails, and the garbage grate of five rails. In each case, the grate rails are supported on two cross

rails carried on brackets bolted to opposite faces of the firebox.

The ash-removal pit of the incinerator, which is of concrete construction throughout, with 4-in. side walls and floor, is essentially a concrete box 4 ft. wide by 12 ft. long, directly in line with the ash pit, with a short approach ramp, whereby ashes from the plant can be removed by means of a wheelbarrow for disposal into cars on the adjacent service track. Owing to the soft character of the ground in the area of the plant, the ash-removal pit was made unusually shallow, having a depth of only 12 in. To keep surface water from entering the pit, the pit walls were extended well above the general ground level.

Charging Platform

The incinerator charging platform, with a total surface area of about 13 ft. by 6 ft., is at a level 5 ft. above the ground, or 6 ft. above the ash-removal pit. This platform, which extends directly over the ash-removal pit, provides a working area 8 ft. by 6 ft., immediately in front of the firebox, and, directly behind this area, a temporary garbage storage bin, 5 ft. by 6 ft., into which garbage is dumped from the garbage collecting and disposal containers, to be shoveled subsequently into the incinerator. The storage bin, 6 ft. high, and with an open front, but covered over the top, is constructed of 2½-in. by 10-in. planks on 2-in. by 6-in. studs, and is lined, bottom and sides, with 18-gage sheet steel. Directly in front of this bin, extending up to the face of the incinerator firebox, the entire charging platform is covered with ¼-in. steel plate as a protection against fire.

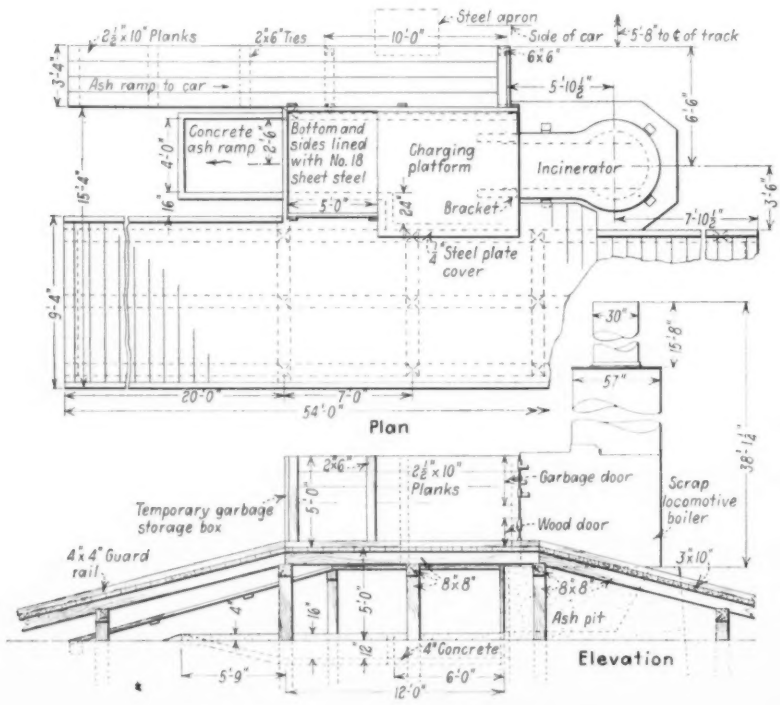
On the side away from the service track, the raised charging platform is reached by means of a two-way ramp, 9 ft. 4 in. wide, with a 20-ft. incline at each end, rising to a 14-ft. level section adjacent to and flush with the charging floor. Thus, garbage disposal trucks from the train servicing platforms, as well as trucks carrying firewood, can be readily pulled up to the firing level, and, when emptied, run off either way so as not to interfere with following loads.

Ash Removal Ramp

For exclusive use in the disposal of ashes and other non-combustible waste materials into cars, a second ramp, 3 ft. 4 in. wide, is provided on the opposite side of the charging platform area, leading directly to a level platform area 10 ft. long, immediately alongside the incinerator service track. From this section of platform, which is at car floor height, and which is walled off from the incinerator charging platform by means of planks, ashes and other debris can be wheeled directly into cars over a portable steel plate apron.

All posts, caps and stringers in the platform and ramp construction were cut and framed from second-hand untreated fir bridge ties, 8 in. by 8 in. in section, while all supporting mud sills are of second-hand bridge stringers, 8 in. by 16 in. Planking on the charging platform and the garbage ramp is new 3-in. by 10-in. fir, while the planking on the smaller ash-disposal ramp, subject only to relatively light wheelbarrow trucking, is of new 2½-in. by 10-in. fir. All drift pins employed in the framing were second-hand, while the bolts and spikes used were new.

Construction of the new incinerator facilities was carried out by the division bridge and building forces of the road under the general direction of B. R. Kulp, chief engineer, and L. R. Lamport, division engineer of the Galena division, and under the immediate supervision of Andrew Olson, supervisor of bridges and buildings.



Plan and Elevation of the Garbage Incinerator

Water Columns and Supply Lines

(Continued from page 412)

columns is not a major solution of the higher-delivery problem, as consideration should also be given to the size of the supply line, its length and the flow head, and (f) the use of an improved type water column with telescopic spout.

Recommendations

1. Make a separate study of each location to obtain the desired results in the most economical manner.
2. The size of the water-column supply line should be governed by the available flow head and the delivery rate desired.
3. The maximum safe delivery rate from special water columns of improved types, serving locomotive tenders of uniform height, is considered to be 5,000 to 5,500 gal. per min., as higher rates of flow will increase the time of taking water because the flow will be tapered off for the last 2,000 or 3,000 gal. to prevent overflowing the locomotive tender, and time will be lost in handling the anchoring devices which would be necessary.
4. The maximum safe delivery rate of the improved-type water columns serving variable-height locomotive tenders without special anchoring devices is considered to be 3,500 to 4,500 gal. per min.
5. Water columns should be standardized to minimize the stock of repair parts required for maintenance and emergency replacements.

Maintenance Man's Role In War Effort Is Vital*

Terminal division superintendent compares railway organization to army. Sees maintenance forces as the "service" department of the railroads, without which they could not function. Suggests ways in which they can help the transportation department "keep 'em rolling" and pledges co-operation of operating and train service employees

By C. P. Fisher
Superintendent,
Pennsylvania, Chicago

THE railroad organization is like an army. In the army, the front line combat troops get all the glory, little being recounted of the endless time and effort on the part of the various services of supply to put them in the front line and to keep them supplied with equipment, arms, ammunition and food. So it is in the railroad game, the transportation department gets the glory for a job well done, or "hell" for a poor job. However, we in the transportation department do not delude ourselves into believing that we deserve all the credit or blame, because we realize that we could not even get started unless the maintenance of way forces have paved the way. The very foundation of the railroads depends upon the maintenance forces, and the extent to which these forces function determines to a large extent the measure of success that can be attained by the transportation department.

While there were some creaks and groans here and there in the railroad structure during the peak traffic of last fall, everybody concedes that a highly satisfactory job was done. Now, when it is estimated conservatively that in 1942 we can expect an increase in business of 10 per cent over that handled last year, we are faced with a still larger job. I don't think anyone can really gage the amount of traffic that the railroads can carry, before the point of saturation is actually reached. We really don't know how much traffic can be moved until we find that we can't move any more, and whether the time will come when we can't handle the load will depend in a large measure on the ability of the maintenance forces to measure up to the test. Nothing has yet stumped the maintenance forces, or railway forces as a whole, and we hope that nothing will.

As the war industries get into full production, the railroads will be compelled to do things never dreamed of before. As maintenance of way men, your share in this undertaking is vital. It means increased and higher standards of maintenance; main tracks must be so maintained as to permit operating more and heavier tonnage trains at increased speeds; yard tracks must be maintained for more intensive and faster switching operations; some tracks will have to be rehabilitated and some renewed. Facilities for new industries will have to be installed promptly. All of this will require increased expenditures and greater attention to detail.

Stocks of maintenance materials must be maintained to the extent that they are available where needed. Derailments due to track conditions must be reduced to the minimum, as they are not only expensive, but also wasteful of that which is most precious today—Time. Derailments, with their resultant delays to traffic, may cause cars to miss connections and trains to lose schedule. These pyramid as the distance to be traveled increases. Sometimes these delays are so important that they necessitate special service to recoup the time lost. War industries are depending upon "on time" arrivals of their vital supplies; the outcome of a battle may even hinge upon freight delays due to derailments.

Delays due to snow, ice and general weather conditions should be foreseen and prevented where humanly possible. Increased attention must be given to coaling stations and water facilities, and last, but not least, to signals and interlockings, to expedite train movements. All equipment containing company material must be released the same day as received, if physically possible, to return these cars to revenue service, and the release of such cars should be reported promptly to the yardmaster or agent for prompt movement. New rail should be laid as early as possible so that the necessary work of tie renewals, cleaning ballast, drainage, etc., can be completed before the peak traffic in the fall.

Particular emphasis must be laid on increased safety and efficiency. With so many of our experienced young men being called into service and so many inexperienced replacements to be trained, it devolves particularly upon we older men to take the new men under our wings, to counsel them in the ways of safety, and to instruct them in the performance of their duties, that they may become proficient as quickly as possible.

Transportation Men Have Part

One of our officers recently referred to the maintenance of way department as the service department of the railroad. We in the transportation department need "service" now as never before—need all that you can give, and I know that you will not

Without the Full Co - operation of the Maintenance Forces, the Operating Department Could Not "Keep 'em Rolling"

*Abstract of an address before the Maintenance of Way Club of Chicago.

fail us. We are not unmindful of the fact that the transportation department can do a lot for the maintenance department. First, we must insure that our new men are properly instructed in safety and trained to perform the work expected of them. There are too many derailments as the result of running through switches carelessly—and too many rear-end and side collisions, resulting in track damage. Material reduction in such accidents will permit the maintenance forces to concentrate on vital maintenance work.

At one time or another we have all seen eclipses of the sun or moon. Scientists can predict the date and hour when such phenomena will occur, but so far they haven't been able to produce them. The world is about to see another form of eclipse—the total eclipse of the "Rising Sun," produced by the concentrated efforts of 130,000,000 red-blooded Americans, and the role of the American railroads will prove a vital factor in bringing that about.

Blackouts—Role of M. of W. Forces

(Continued from page 406)

measure being tried out is the use of bright yellow paint, and, in some cases, phosphorescent paint, to mark the edges of platforms and stairs, combined with the use of phosphorescent directional signs.

Switch Lamps

Awaiting the recommendations of the A.A.R. committee on blackouts, most roads have done little or nothing relative to hooding or otherwise obscuring switch lamps, in spite of the fact that it is recognized that both in yards and out on the line, such lamps might be a tell-tale to track locations and train operation, if not to vital areas. A few roads, however, have experimented quite extensively with hoods for their switch lights, in conjunction with hoods which have been developed for wayside and interlocking signal lights. In most cases, these switch lamp hoods are of sheet metal, painted a dead black, and extending out 4 to 5 in. from the lamp lenses. Where the hoods impair clearances and present a hazard to trainmen, they are being made of various types of flexible material, including both leather and old automobile tire carcasses. Obviously, the purpose of any of these hoods is to cut off all upward slanting light rays, making the lights visible only from positions directly in front of them.

Even where such hoods have been provided, the problem of light reflection on the track rails has presented a problem. To overcome this, at least one road is painting the lower segments of its switch lamp lense with black paint to cut off downward deflected rays, and experiments have also been made in blacking the entire lenses except for a narrow slit horizontally across the center.

Ready for Bomb Damage

Of equal importance with the various measures described in the foregoing, are the precautions that the railroads are taking to expedite the repair of bomb damage if such damage should occur. These precautions consist essentially of refinements applied to the methods and organizations that are already in existence for coping with such emergencies as track and bridge washouts, derailments, and other types of damage. Regarding these normal forms of damage, individual roads know from experience where their most vulnerable points are, and where trouble is most likely to develop. Thus, they have been able to make their plans accordingly. In the case of bomb damage, however, which is likely to occur anywhere at any time, new conditions are introduced which must be given consideration in formulating plans for carrying out repair and rehabilitation work.

Emergency Stocks

On some roads, these amended plans have included the accumulation of emergency stocks of timber-trestle material, which are stored at strategic points. However, experience in England has demonstrated that bomb craters are seldom so large that they cannot be filled quickly with embankment material, and, in view of this, several roads have taken steps to assure themselves of a supply of such material. On one road in particular, where it has been the usual practice to accumulate supplies of cinders in the winter months for use during the working season in widening embankments and cindering cut slopes, such supplies have been accumulated during the last winter on a greater scale than usual and are being held for the specific purpose of making repair to any bomb damage that may occur.

Another step that has been taken by one road has been to remove to other locations parts of a considerable stock of emergency bridge material that was formerly maintained in the vicinity of a large city—this being done to decentralize the material so that, in the event of an attack, the danger of losing all of it would be minimized. Still another road has loaded stocks of various emergency repair materials in cars so that they will be available for immediate shipment to points of damage.

Record of Materials

An example of the refinements in repair organization that can be made in order to be able to cope with bomb damage most effectively is afforded by the practice of one road which has compiled a complete record of all available materials, machines and key men for bomb damage repair work. As regards manpower, this record not only gives the names and locations of supervisory officers and foremen, but also the names and addresses of all work-equipment operators and a record of the types of machines that each man is qualified to operate. Also, in addition to listing the various items of company-owned work equipment and their locations, the record contains a listing of contractor-owned equipment, suitable for railroad use, that is available at various locations.

Our Part In the War Effort

(Continued from page 407)

must be handled, and you are going to have to provide for them. It means, of course, that you must take care of all new material as it is issued, and that you must make the best possible use of all second-hand material.

Also, we face more of a turnover in labor than we have had in the past. One of the very important elements in this problem will be the attitude of the older employees, who must work with the new men taken on, and who must see that they are made into the right kind of railroad men. Your supervision will have to be better, but the training of the new personnel must necessarily be largely in the hands of the older men who are left on the job, and I hope that we can impress them with the fact that this is their responsibility and their part in helping win the war.

There is still another problem which warrants your attention. We must all make larger contributions in the way of purchasing war bonds. You no doubt have read of measures which are under consideration in Congress looking toward the withholding of a certain percentage of everyone's pay. The success of this financing will be better if we can make it voluntary.

Modern Ballast Plant On the Union Pacific

ONE of the largest and most modern crushed gravel ballast processing plants in the United States has been constructed for the Union Pacific by the Utah Sand and Gravel Corporation at Evanston, Wyo. This plant, which is designed to handle 1,000 tons of pit-run material and to produce about 650 tons per hour of finished ballast ⅜ in. to 1¾ in. in size, employs modern crushing, screening and conveying equipment, all electrically operated.

The plant is located at an immense deposit of gravel which is very hard and is so sized that a large percentage of crushed aggregate may be secured in the finished ballast. The deposit is located above the level of the tracks and it was necessary to excavate and handle approximately 100,000 cu. yd. of gravel to provide a site for the plant at the grade of the tracks. The plant is of fireproof construction, with concrete and steel footings, steel superstructure and steel conveyor sections. All electrical wiring is completely enclosed in conduit and timber is used only in the catwalks, platforms, and the pit hopper. In addition, a job office, oil warehouse, and small repair shop were erected on the property.

The plant consists essentially of a pit hopper, a crushing plant, a screening plant and storage tanks, all connected by belt conveyors and all electrically-driven. The pit-run gravel is loaded into a hopper, which is approximately 16 ft. by 22 ft. in dimensions and which has an open top. No grizzly bars are utilized on the hopper because the pit rock is very uniform in size, and the crushers will handle any size found in this deposit, the maximum size of which runs up to 8 in. to 10 in. in diameter.

Crushing and Screening

This pit-run material is delivered from the hopper to the No. 1 belt by a 48-in. heavy-duty double plated feeder of 1,000 tons per hour capacity, driven at 122 r.p.m. by a 30-hp. reducer motor, with a slow-speed shaft. This belt is 42 in. by 216 ft. and is driven by a 75-hp. motor; it travels at a speed of 330 ft. per min. The pit feed is split at the head end of the belt onto two scalping screens, each of which is a 4-ft. by 12-ft. double-deck heavy-duty vibrating screen. Each screen is powered with a 10-hp. motor. The oversize feed from the scalping screens is dropped into a 4-ft. gyratory crusher, powered with a 125-hp. motor, which is set for a 2-in. opening. Finished aggregate from the crusher is passed onto the No. 2 conveyor belt, with added material from the scalping screens, that is less than 1¾ in. in size. The No. 2 conveyor is 48 in. wide by 177 ft. long, and is driven at a speed of 400 ft. per min. by a 75-hp. motor.

At the discharge end of the No. 2 conveyor, the belt feed is split onto four 4-ft. by 12-ft. double-deck heavy-duty finishing screens, all powered with 10-hp. motors. All aggregate larger than 1¾ in. in size is gathered and returned to the crusher on the No. 3 conveyor. This conveyor, a 24-in. by 171-ft. belt, travels at a speed of 300 ft. per min. and is driven by a 15-hp. motor. Finished ballast is taken from the bottom deck of the finishing screens and elevated to loading bins by the No. 4 conveyor belt, which is 42 in. wide by 160 ft. long, travels at a speed of 375 ft. per min., and is powered with a 60-hp. motor. Finished ballast is dropped from the No. 4 conveyor into large steel tanks, which have a capacity of approximately 800 tons, and which are equipped with bin gates operated at a central point beneath the tanks.

Located parallel with the screening plant is a small sand-gathering conveyor which recovers all fines less than ⅜ in. in size. This conveyor is 30 in. wide by 40 ft. long and discharges onto the No. 5 conveyor, which is 30 in. wide by 200 ft. long. These two conveyors travel at a speed of 350 ft. per min. The No. 5 conveyor is powered with a 50-hp. reducer motor, and has a lift of approximately 45 ft. for stockpiling waste fines; it is so equipped that it can be extended to 700 or 800 ft. by the addition of conveyor sections and the lengthening of the belt.

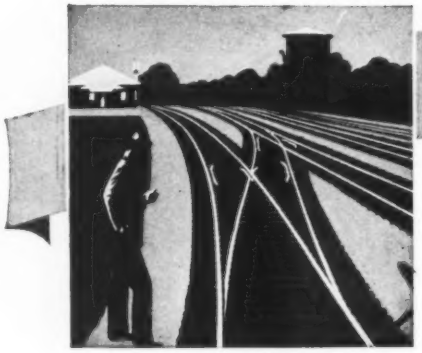
Centralized Control

The plant is operated from one central control room. All motors are equipped with across-the-line starters of the push button type. The plant is equipped for twenty-four hour operation, being provided with sufficient flood lighting at necessary points. Power for operation is secured directly from a 44,000 volt line, the voltage being reduced to 440 volts by a bank of three 150-kva transformers. The power substation and all pole and transmission line construction was performed by the Utah Sand and Gravel Products Corporation.

At present the excavation to feed the pit hopper is being made with a 1½-yd. Diesel shovel. This unit loads into seven-cu. yd. dump trucks, and the hopper feed is supplemented by using a Caterpillar bulldozer. The bulldozer is also utilized in spreading out the waste sand and fines which are disposed on the stockpile. The use of a shovel and trucks for the pit excavation was prompted by the necessity, at the beginning of the work, for providing sufficient space for the stockpile of fines. For future operation it is intended to load material into the hopper by means of Caterpillar tractors and 24-cu. yd. Carryalls or a 3 to 3½-cu. yd. shovel, with some type of side-dump, rubberized motor truck equipment. Permanent excavation equipment will be secured after a thorough study of the pit and aggregate conditions has been made to obtain the most efficient and economical equipment for high tonnage production.

This plant was designed by the Stephens-Adamson Manufacturing Company, Aurora, Ill.

General View of the Union Pacific Gravel Ballast Plant, Located at Evanston, Wyo.



WHAT'S the Answer?

How Long Should They Season

How long should ties be treated before they are to be inserted? Why? Does the species of wood or the kind of treatment make any difference?

Two Different Aspects

By T. M. Pittman
Division Engineer, Illinois Central, Waterloo, Iowa

This question has two different aspects—one physical and the other economic—and both must be considered. Any preservative treatment softens the wood fibre to a degree that varies with the species of wood and the kind of treatment given, as well as the condition of the wood before treatment. From a physical standpoint the wood should be held in storage until it is dried out thoroughly. The length of time required to do this will depend on the kind of wood, the nature of the treatment, the season of the year, the weather conditions and the method of storing the ties.

Ordinarily, the excess preservative will evaporate and the wood will harden after about six months, but if conditions permit it will probably be better to extend the seasoning period to a full year. I do not know, however, of any tests or experiments that have been conducted to determine just how long this period should be.

Economic considerations and the available supply of ties make it desirable to use them as soon as possible after treatment. Most roads do not want to burden their stocks with a large supply of ties that are undergoing seasoning, or to carry the inventory investment necessary to do so. Furthermore, in many cases, the supply of ties is so small and the demand for them is so great that maintenance officers are willing to use the soft unseasoned ties rather than wait for them to season.

In those cases where the year's supply of ties is installed in a few months, it becomes necessary to assemble a large stock in advance of the demand which arises when the work of renewing ties is started. In these cases, the economic conditions permit more thorough seasoning than would otherwise be practicable. There does not appear to be much difference between the different kinds of woods or the different classes of treatment, except in the length of time required for seasoning.

Store for Six Months

By B. D. Howe
Chief Lumber Inspector, Louisville & Nashville, Louisville, Ky.

Ties should be stored in close stacks for at least six months after treatment before they are shipped out on the line for use. Some of the reasons for this statement are:

1. Materially less damage will be done to the tie by reason of the tie plates seating themselves on ties that have been allowed to season after treatment than when freshly-treated.

2. Seasoned treated ties can be handled by the trackmen with greater comfort and safety than freshly-treated ties.

3. When ties are treated by the Reuping process, the imprisoned air causes some of the preservative to exude from the tie for several days after they have been removed from the retort. If the ties are placed in closely-stacked piles, this exuding preservative will be of value to the sur-

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in August

1. *What features should be incorporated in the design of a tool box for motor cars? Why? How should the tools be stowed?*

2. *Since the supply of bristles has been shut off, what measures can be employed to conserve the paint brushes now on hand?*

3. *What are the advantages of a finger-free fit for nuts on track bolts compared with a wrench fit? The disadvantages?*

4. *What precautions should be observed when supporting a weak girder span?*

5. *What considerations determine whether ties shall be renewed by the group or spot method? What is the importance of each?*

6. *Where friction losses in a long discharge line reduce its capacity below delivery requirements, what are the relative advantages of installing a larger pump and of employing a booster pump? Where should the latter be located? Why?*

7. *In view of the present demand for cars, is it preferable to unload cinders on the road currently or to store them at the points of origin? Why? What are the advantages? The disadvantages?*

8. *What factors should be given consideration in determining whether to insulate an existing building? What is the weight of each?*

rounding ties in the stack, because it will tend to fill the small seasoning checks that develop after treatment. On the other hand, if the ties are distributed along the right-of-way immediately after treatment this preservative which bleeds from the ties is lost.

In general, the foregoing applies to ties of all species of woods. Seasoning after treatment is of special advantage where open-cell treatment is employed if, owing to the nature of the preservative, the penetration is light, or where the ties are only partly seasoned when treated.

Get Them in Quickly

By Paul L. Zepp
Transitman, Baltimore & Ohio, Punxsutawney, Pa.

From the standpoint of prolonging the life of a tie which, in the normal course of events, will fail from decay, it should be inserted in the tracks as soon as possible after it has been treated. Assuming that the tie has been treated with creosote, its life will be terminated by decay finally when all of the toxic constituents of the preservative have evaporated. This process of volatilization begins as soon as the treated tie leaves the retort and continues regardless of whether the tie has been inserted in the track. Consequently, any time that is devoted to storage for the purpose of seasoning the tie before it is placed in the track can be counted as so many months lost from its useful life.

Some advantage may be gained by holding bridge ties in storage for a period after treatment. If this is done, the lighter and more easily ignited constituents of the creosote will be given a chance to evaporate from the surface of the wood before the ties are applied, thus reducing the fire hazard. These lighter fractions have an extremely low flash point. Because of this low flash point, ties fresh from the retort constitute a real fire hazard.

As the period after treatment increases and the more volatile fractions evaporate, the flash point of the creosote on the surface of the tie increases slowly, and eventually the treated tie becomes little, if any, more of a fire hazard than an untreated one. However, the advantage gained in lessening the inflammability of the tie is gained at the expense of some of its serviceable life, since this life can be protected only so long as the toxic elements of the creosote remain in the wood.

Regardless of the character of the treatment or the species of wood, holding the crosstie in storage after treatment can only result in a decrease in its serviceable life approximating the length of time it is held in storage. On the other hand, the kind of treatment and the species of wood do make a difference in the ease with which the wood will accept the preservative and, therefore, the depth to which it penetrates.

In the case of bridge ties, those species of wood, such as white oak, and those methods of treatment, such as the full-cell process, which leave a thicker film of creosote on the surface of the wood will naturally create a greater fire hazard. These ties will require a longer time for the surface to dry, and for this reason will need to be held in storage for a longer time before the lighter fractions of the oil evaporate, to reduce the fire hazard.

Sanding Paint Coatings

Is there any advantage in sanding paint coatings on stations and other buildings? If so, what? If not, why? How can this be done?

Protects the Surface

By W. C. Harman
Supervisor Bridges and Buildings, Southern Pacific, San Francisco, Cal.

Primarily, the purpose of sand painting is to provide a protective coating for the surfaces of the building over the areas that are most likely to be marred or disfigured. In addition, this form of painting has certain fire-resisting qualities that are well known. In fact, the use of sand-painted surfaces is widespread for the protection of trestle and other bridge decks that are exposed constantly to fire hazards.

For many years some roads sanded the painted exterior surfaces of both passenger and freight stations to a height of six feet, and after several paintings the coat became hard and resistant to wear and tear, especially that incident to the handling of freight, and to general abuse. The interior wall surfaces of toilets were treated in the same manner to protect against the urge of scribblers to write obscene verse or draw obscene pictures. Since the surface was rough and somewhat flinty it offered an unsatisfactory field for the exercise of the talents and skill of the wood carver and the autograph writer.

As the demand for more modern designs in buildings and for new styles in painting began to be felt, sand painting was replaced with more artistic protective coatings, except in structures of minor importance and those not used by the public, and for fire protection. The economy which this method of painting demonstrates with respect to both material and application, still makes it a very desirable form of coating for public buildings and, with the advent of spray painting its use is again gaining popularity.

Sand casting by hand was an art that required considerable skill and experience, to assure that the sand would be spread evenly and neither too sparsely nor too thick, and that the color tone of the paint remained uniform. An inexperienced caster or one who had not acquired the necessary skill could easily produce an unsatisfactory coating from the standpoints of both protection and appearance.

Where spray painting is practiced, sand paint can be applied very satisfactorily and excellent results can be attained, if the operator has the required experience. The combination of paint and sand that is uniform in size, mixed well in the spray pot in the correct proportions, will flow easily and will cover rapidly.

Has Discontinued Practice

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Because the sanding of paint coatings on station and other buildings increases the labor cost materially, because the sanded area shows discoloration and because we considered that this form of painting serves no useful purpose, we discontinued the practice of applying sanded paint coatings on all buildings more than 20 years ago. My experience has been that the sanding of the paint causes a large increase in the labor cost when the sanded surfaces are cleaned for repainting. In fact, it is almost impossible to clean a sanded surface without the use of a flame to soften the paint film so that it can be scraped off. Obviously, this slows down the rate at which the cleaning can be done and increases the labor cost, compared with an unsanded surface.

In former years, the practice of sanding paint coatings was for the

purpose of eliminating damage to the structures by outsiders who used the station grounds as a loafing place. Idle hands generally get into mischief and it was not uncommon for these loafers to cut letters, usually their initials, or figures on the sides of the buildings or to whittle the edges of the weather boards, the corners of the window and door frames or the window sill. At present, however, the people in general seem to appreciate the clean, neat and attractive structures provided by the railway in their villages or cities. Today, they take a real interest in keeping these structures neat and in good condition, so far as their own actions can contribute to this end. There are so many disadvantages, and no advantages, to the sanding of paint that I do not recommend the practice.

Sees a Revival

By General Inspector of Buildings

I have been particularly interested in this question, because it relates to a practice that was almost completely discontinued about two decades ago, but which shows evident signs of revival. Years ago the sanding of paint became a common practice because of the peculiar mentality of those who, with no reason for doing so, except that it was a handy place to loaf, hung around railway stations. These loafers were given to a form of vandalism which found its expression in carved initials, holes whittled through the siding, corners shaved off and even attempts at pictorial carving. Others who lacked the skill to do these things found the outlet for their degenerate energies in the writing of obscene poetry or the drawing of obscene pictures. Sanded paint coatings discouraged these activities, because no knife would hold its edge and pencil points wore too rapidly on the rough flinty surfaces, making the writing or the drawing illegible.

If clean sand is applied with even distribution to a painted surface there should be no discoloration of the paint and, in addition to discouraging vandalism, its resistance to ordinary wear is increased. In former years, the sand was cast by hand against the freshly-painted surface, and it required expert skill to obtain a satisfactory job. Only a few men ever attained this skill, and many jobs were quite unsatisfactory because inexperienced men were permitted to do the casting. Today paint spraying equipment offers an opportunity to make an even distribution of the sand, with practically no additional cost.

Since the form of vandalism which has been mentioned is still in evidence, I for one would like to see the practice revived. If it is, sanded coatings should be applied to the plastered walls of toilets or other surfaces that can be written upon, as well as to the exterior walls or frame stations, offices and other buildings where this form of nuisance still persists.

Preframing Treated Bridge Ties

Is it practical to preframe ties that are to be treated and applied to deck plate girders? If not, why? If so, how is the necessary information obtained? What provision should be made for rivet heads?

Is Entirely Practical

By G. A. Belden

Engineer of Bridges and Buildings, Central of Georgia, Savannah, Ga.

On the Central of Georgia it has been found both practical and economical to preframe ties that are to be treated and applied to deck plate girders, as well as to other types of steel spans. The preframing is done at the treating plant from detailed framing plans prepared in the office of the chief engineer. Generally, the office records and the detailed plans of the structures are complete enough to provide all of the information needed for preparing the framing plans, but where additional information is needed, it is obtained from detailed measurements and surveys made at the bridge.

Our practice in renewing ties on steel structures is to replace a series of ties out of face, generally beginning at one end of the bridge, using any serviceable ties thus released for patching ahead of the out-of-face work, until the remainder of the deck is in need of renewal. No special provision is made for rivet heads, since it has been found that the new ties will seat themselves on the rivet heads and come to a uniform bearing under traffic. To insure that the ties will be placed correctly on the structure, a numbering plan is prepared, on which each tie is given a number and this number is stamped on the tie at the treating plant, after it is framed.

One of the first structures on the Central of Georgia for which the ties were framed before treatment, was a steel viaduct 1,541 ft. long, built in 1916. This structure consisted of 49 spans, of which three were through girders and the remainder, 46 spans, were deck girders, requiring a total of 1,681 ties. The alinement included 233 ft. of tangent, 668 ft. of 6 deg. 22 min. curve and 640 ft. of spiral. Framing plans for these ties were made from the structural steel drawings, each tie being numbered and applied in accordance with a numbering diagram. In 1932 it became necessary to renew 963 of these ties, 351 were renewed in 1938 and the remainder in 1941. All of the ties used in renewal were preframed in accordance with the original plan.

Practical but Laborious

By Julius M. Bischoff

Office Engineer, Terminal Railroad Association, St. Louis, Mo.

It is practical but laborious to preframe ties that are to be treated and installed on deck plate girders. The procedure consists of making a field survey, first marking the center lines of the ties on the deck plate girders, then measuring the distance from this center line to the inside edges of the cover plates, and the width and thickness of the cover plates. After the field data have been secured, detailed drawings must be made for the framing of the individual ties.

For a new bridge, the framing data can be taken directly from the structural steel drawings; however, some adaptations are generally necessary after the ties are on the ground because of imperfections in fabrication and erection. In these cases the cut surfaces should be painted with hot creosote.

Ties can either be cut to allow for rivet heads or installed without these cuts, in which case the ties are placed in position and the rivet heads are forced into the ties by several runs of a heavy locomotive. The latter method is preferable and has been used with good results. It also eliminates considerable labor.

Creates No Difficulty

By L. H. Harper

Formerly Superintendent of Creosote Plant, Central of Georgia, Macon, Ga.

It is entirely practical and usually quite desirable to preframe ties that are to be treated and applied to deck

plate girders. In the case of new girders, the necessary information can be obtained from the steel plans. This is also true in the case of renewals, if the plans are known to be correct. Where doubt exists, it is best to take measurements in the field to verify the spacing of the girders, as well as the length, width and thickness of the cover plates. In any event, the information is given to the treating plant in the form of framing plans, with the individual ties designated numerically. The numbers are stamped in the line end of the ties before they are treated, and the erecting force is provided with a diagram explaining the system of numbering.

In the case of southern pine ties, the matter of rivet heads presents no problem, because the first locomotive passing over the bridge will seat the rivet heads into the ties without causing undue damage to the timber. Where certain hardwoods are used for bridge ties, it becomes necessary to do countersinking in advance to take care of the rivet heads. This naturally calls for additional information with respect to the location of the rivets.

While other factors, such as checking and surface splitting, contribute to the premature failure of bridge ties, at least one common cause—decay by reason of cutting into the untreated portion of the wood—can be eliminated by preframing the ties.

A Longstanding Practice

By L. G. Byrd

Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

For more than 23 years it has been our practice to preframe all ties to be treated before they are applied on both deck and through plate girders, as well as on through and deck truss spans. As a result of both new applications and of replacements we find that the practice is entirely practical. The preframing that we do includes holes for the spikes holding both the running rail and the inside guard rail, for anchor hook bolts and for attaching guard timbers by means of bolts or lag screws, as well as daps for rivet heads. Practically all of our deck plate girders that have been erected during the last 10 years are protected by an individual cover plate as a protection to the girders and braces as a result of brine drippings. Where these plates are employed, there are no rivet heads to interfere with the ties.

Where rivet heads are encountered, we prefer to dap the tie so that it barely clears the rivet heads. In a few cases, where ties were applied without this framing, it has been noted that rivet heads coming close to the edge have caused the side of the tie to split or burst off. Again, if the ties are not dapped for the rivet heads, there will be variations in the surface for a time, more on some lines than on others, depending on the amount and character of the traffic. Where ties are renewed without being dapped for the rivet heads, they must be placed accurately before traffic is allowed to pass over them, or it will become necessary to raise the track to allow the ties to be lifted off the rivet heads and replaced in proper position. This necessity creates additional labor costs. We have had no failures of ties as a result of dapping them for rivet heads. The first signs of failure occur directly under the rail as a result of the mechanical abuse to which every tie is subject. We consider that dapping the tie for rivet heads increases the life of the treated material by eliminating the form of damage which has been mentioned.

When Making Heavy Ballast Lifts

When making a heavy raise on stone ballast, what interval should elapse between the first and second lifts? On gravel? On chatts? Why?

Must Let Ballast Settle

By Engineer Maintenance of Way

That some interval must elapse between the preliminary and final lifts when the track is being given a heavy raise on new ballast is scarcely open to debate. The extent of this interval will depend, however, on several factors so that it cannot be fixed as a rigid rule, the principal ones of which are the volume and character of the traffic passing over the track.

No matter how carefully the work is supervised or how thoroughly the ties are tamped, if the track is given a heavy raise there will be settlement after the surfacing has been completed. This raises two questions—how much the lift must be before the raise is considered to be heavy, and how much settlement may be expected. In neither case are the limits well defined; the first is partly a matter of opinion. Generally, however, we consider 4 in. to be the point which divides a light from a heavy raise, this point being chosen because, with a raise of 4 in. or less, mechanical tie tamping will compact the ballast sufficiently to prevent troublesome settlement of the track and obviate the necessity for a second lift.

How much settlement can be expected? This is not answered easily, for the magnitude of the settlement will depend somewhat on the amount of the raise, on the character of the ballast and on the thoroughness with which the ties are tamped. If the raise is more than 4 in., no amount of either hand or mechanical tamping will prevent settlement, for which reason, just as good and a much less expensive job of tamping can be done with shovels or ballast forks. However, it requires experience and care on the part of the foreman to insure that the tamping will be done thoroughly and uniformly.

Normally the amount of settlement and the time required to complete it are of less importance than that it shall take place uniformly. In general, the type of the ballast has less influence on the amount of settlement and the interval necessary for compaction than its size and the percentage of fines it contains. Ballast of the larger sizes of stone, that is not well graded, will settle more and will often take longer to compact than almost any other kind. Gravel containing considerable sand, and chatts crushed to small sizes, will show much less settlement and compact in less time.

Experience has shown that traffic will compact the ballast better than any method of tamping that can be employed, and it will do this so well that practically no further settlement will occur after the final lift is completed. The time required to do this for any particular ballast will depend on the amount of traffic passing over it. We usually consider that three days is the minimum we should allow and that the interval should not be greater than four or five days, even on lines of comparatively light traffic, and we fix these periods without regard to the type of ballast.

Four Days Is Enough

By Supervisor of Track

One should exercise the same care in making the first lift of a heavy raise, whether it be 6 in. or 12 in., as he does in making the final lift, for uniformity of tamping will do more

to insure a smooth-riding surface, by assuring uniform settlement of the ballast, than any other action that can be taken. Obviously, the ordinary method of tamping with tie tampers, tamping picks or tamping bars, cannot be followed with the types of ballast mentioned in the question when the track is being lifted six or more inches, for in most cases 4 in. is the limit for ordinary methods of tamping. This means that for these higher lifts the tamping must be done with shovels or ballast forks, and that the ballast cannot be compacted as it is chucked under the tie. For this reason, while the space under the ties must be filled with ballast, the uniformity with which this is done is of the utmost importance to insure uniformity of settlement.

It becomes necessary, as well as highly desirable, therefore, to permit traffic to compact the ballast applied in the first lift, to prevent settlement after the final lift is completed; in fact, so far as I know, this is the only way that it can be solidified satisfactorily under the methods of track work in vogue in this country. I am told that in some places in Europe it is the practice to remove the track entirely, spread the new ballast and then compact it with a road roller before the track is restored. Certainly, such a practice is not feasible under the maintenance practices in vogue in this country.

In general, three factors will be the most important in determining the interval between the first and second lifts. These are the magnitude of the first lift, the size and grading of the ballast and the density of traffic. Poorly graded ballast of large size will be relatively loose after it is chucked under the tie and will, therefore, settle more and require a longer time to solidify than well-graded material. The size and grading of the ballast are more important in this respect than the kind of material. Obviously, the higher the raise, the greater the settlement is likely to be as the ballast compacts under traffic. Again, the ballast on a line of dense traffic can be expected to solidify sooner than on a lighter-traffic line.

No rigid rule can be enforced respecting the interval that should elapse between the first and second lifts. No matter how carefully the tamping is done, and it should be done with the same care as the final surfacing, weak places will develop, and sufficient time should be allowed for all of these weak places to appear. A small surfacing gang should always be assigned to cover the track during this interval, to pick up and correct these places and keep the track riding smoothly until the final surfacing is completed.

This is a matter that I do not like to push too much; neither should it be drawn out too far. While a shorter time may be sufficient in some cases, generally, four days should be allowed to insure that full settlement has occurred and that all weak spots have been cared for; in others an additional day may be permitted. It is far better to extend this interval a day or even two days beyond the actual requirements than to shorten it to the point where the settlement will continue after the final surfacing.

How to Handle Jacks?

When surfacing track out of face, how close to the jacks should the tamping be carried before they are moved ahead? Why? Does the amount of the lift make any difference? Why?

Hold Raise on Jack Ties

By E. L. Banion

Roadmaster, Atchison, Topeka & Santa Fe, Marceline, Mo.

The usual procedure followed in surfacing track out of face is to tamp one or more jack ties at each setting of the jacks. After the jack tie has been tamped, the jacks are moved ahead to the next joint or center and the operation is repeated. In this method the jacks are well ahead of the tamping and the raise rests on the jack tie until the tamping reaches it.

Particularly where tie tampers are employed, the practice of using multiple sets of jacks finds favor in certain quarters. This method requires the use of 12 to 16 track jacks, placed in pairs opposite each other on both rails near each joint and center. While this method allows a rough surface to be secured, it has been noticed that the refinement in surface demanded by present-day high-speed schedules is lacking. The principal cause for the irregularities which creep in is the difference in settlement which occurs in the seating of the rail and tie plates. It is difficult to correct these irregularities after the track has been fully tamped.

It has also been noticed that where the multiple-jack system is used, the joints are frequently "humped" off the jacks. Another objection of the multiple-jack system is the difficulty of getting the rear jacks to the forward position when they must be moved. As an example, if 16 jacks are used on 39-ft. rails, the back jacks must be carried 136 ft. every time they are released, and this is no small chore where heavy jacks are used. In this case, the usual method of sliding the jack on the rail to the next point of setting cannot be employed, because the other jacks set in place will hinder such an operation.

Now, as a direct answer to the question, where the multiple-jack system of raising track out of face is employed, the rear jacks should remain in place until the tamping progresses to within two ties of the jack. Where the jack-tie method of raising the track is followed, the jack will obviously be out of the way some distance in advance of the tamping. I fail to see how the amount of the lift will make any difference.

Do Not Go Too Close

By District Engineer

Tamping should never be carried too close to the jacks. If a considerable raise, say 3 or 4 in., is being made, the jacks should be kept at least a rail length ahead of the tamping, and the raise should be held by tamping one or two ties at the jack. If the joint is to be raised, the jack should be set three or four ties ahead of the joint; otherwise there is danger that the weight of the track ahead will cause the joint to raise too much. When the joint is at the correct elevation, both joint ties should be tamped before the jack is moved to the next setting.

Where ballast has been unloaded in preparation for the raise and the track is filled with ballast to the top of the rail, a single pair of jacks may not be enough to lift the added weight. In this case two or three pairs of jacks should be employed to bring the track up, but the jack ties should be tamped to hold the raise before the jacks are moved ahead. In this way the jacks are always some distance, often several rail lengths, ahead of the tamping.

Some trackmen do not tamp the jack ties where a large gang equipped with tie tampers is employed in the surfacing operation. Instead, they use from six to eight pairs of jacks and hold the track on the jacks until the tamping is close at hand, moving the rear jacks to the front just in time to

avoid interfering with the tamping. I have never been in favor of this practice because my observation indicates that there is danger of humping the track, while the finished surface does not ride as smoothly as that of track where the raise has been held on well-tamped jack ties.

Causes of Personal Injury

What are the principal causes of personal injury in bridge and building work? How can they be eliminated?

Causes Seem Trivial

By Supervisor of Bridges and Buildings

When analyzed, many of the common causes of personal injuries seem to be most trivial. Yet the records show that they have often resulted in severe injuries which could have been avoided by even a small amount of care. Failure to wear goggles when needed has caused much loss of eyesight. Failure to take the nails out of a scrap of lumber or to turn it over so they will be in the ground, has infected many feet with blood poison.

Power tools have been a boon to bridge and building men; yet many injuries have resulted from failure to see that removable parts, such as drills, rotary brushes, chipping blades, etc., are fastened securely in the chucks before the tools are used. Scaffolds have always been a source of trouble, from loose foot boards, from failure to make the uprights immovable, from lack of adequate bracing, from absence of railing, from failure to insure against the dropping of tools and loose materials and from allowing men who are affected by altitude to work on high or swinging scaffolds.

Many accidents would not have occurred if the foreman and men had been taught how to tie simple safe knots. Dull tools should never be allowed on the job, nor should broken or worn tools or tools with cracked or loose handles. Oil or grease should not be allowed on striking tools or on wrenches. Worn rope and defective pulleys can cause extremely severe injuries and even fatalities.

Carelessness Causes Most

By General Inspector of Bridges

Basically, carelessness is either the sole cause or the principal contributing cause of at least 90 per cent of the personal injuries that occur in all phases of maintenance of way work. If the events leading up to the remaining 10 per cent are analyzed carefully, carelessness will be found to be present in some degree in most of them. In other words, unavoidable injuries represent only a small percentage of all that occur.

Bridge and building work possesses certain inherent hazards, because it requires a multitude of different duties, many of them unrelated, and because the forces often work in emergencies at night in storm and flood. Despite this, however, emergency work accounts for only a small percentage of the total injuries to bridge and building men. On the other hand, many severe injuries, as well as those of a minor nature, spring from apparently insignificant causes.

Baggy or torn clothing may result in injuries, especially to men working around power machines and tools. Loose soles, worn soles and run-down heels, metal heels and sole plates may cause a man to stumble or slip at a time when safety requires surefootedness. Dull tools, loose handles, burrs on sledges, a dull point on a cant hook, an insecure chuck on a drill or reamer or a wrench with worn or loose jaws, all of which, of themselves, may seem to be of small importance, have done their part to fill the record of injuries and even fatalities. The record is also replete with mention of sightless eyes from failure to wear goggles. This list might be extended, but these typical examples are sufficient to show that the commonplace items of carelessness particularly need correction.

Can Wood Pipe Be Used?

In view of the restrictions that have been placed on civilian uses of iron and steel, to what extent can wood pipe be adapted for railway water service? What are its advantages and disadvantages, compared with steel and cast-iron pipe?

Has Relatively Short Life

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Wood pipe was used centuries ago, and it is said that pipe of this kind was laid in London in 1613. Its usage was common in our eastern cities 100 years ago. Wood pipe excavated in Chicago some years ago was found to be in a good state of preservation after having been in use for more than 50 years.

As the country became settled, this rather extravagant use of good timber was superseded by a design of wood-stave pipe, using wood 1½ to 2 in. thick, cut circular both inside and out, and held together by steel bands. The spacing of the bands was proportioned to the water pressure for which the pipe was intended. Pipe of this design was first used in 1874. It had tapered joints similar to stave pipe and was driven together to make water-tight joints. These joints were not satisfactory and were changed to the butt-end type and a mortise and tennon joint. Other designs used a collar or sleeve to lap over the joint. Iron bands to hold the staves in place were effective and are still used for all large-diameter pipes, such as those for irrigation ditches, but for the 6, 8, 10 and 12-in. sizes used for city and railway water supplies, the pipe is usually wound with galvanized iron wire, coated with asphalt and then rolled in sawdust to give a surface that will facilitate handling.

The first consideration that commends pipe of this type is its low cost, which is roughly one-half that of cast-iron or steel pipe of the same size. Small communities have started out with a few miles of wood pipe and then have changed over to cast-iron pipe gradually when the maintenance of the wood pipe became excessive. Being comparatively light in weight, 15 to 20 lb. per ft., wood pipe is advantageous for gravity pipe lines through mountain, forest or rocky slopes, where the work must be done largely by hand.

It is also smooth on the inside and is not subject to tuberculation as the iron pipe is, while its frictional resistance is 30 to 40 per cent less. Many long railway water-supply lines have been constructed of wood and then gradually replaced with more

permanent material. While wood pipe is designed for the pressure it must withstand, it usually starts to leak first at the lower end where the pressure is greatest. In some cases this is the result of decay of the wood, but more frequently of soil corrosion of the wire winding.

Wood stave pipe as now developed is usually dependable for about 10 years. It would seem, therefore, to be particularly desirable for cantonments or other comparatively temporary installations, provided the restrictions that have been placed on the use of metals do not prevent the use of wire for the winding of the pipe or of the steel bands required for the larger sizes of pipe. In some cases, asbestos cement pipe may serve the national effort satisfactorily and be a good substitute for cast-iron pipe, provided sufficient rubber is available for the rings at the joints.

Does Not Favor

By Supervisor of Water Service

In my experience, wood pipe is not a satisfactory substitute for cast-iron, wrought-iron or steel pipe, although I recognize that in the present emergency we should not be too critical of the materials we are forced to accept as substitutes for those on the restricted or proscribed list. In most situations cast-iron pipe has an almost unlimited life; maintenance is practically nil, provided the joints are made properly at the time of installation; and it will withstand very high pressures. In contrast, the life of wood pipe is relatively short; after a few years, maintenance becomes troublesome; and the normal designs are restricted as to the pressures they will withstand, although this pipe can be designed for high pressures.

In general, pipes of the sizes and for the pressures that are commonly required in railway service are wrapped spirally with galvanized wire before they receive their coating of asphalt. Those for higher pressures are made with iron bands, the spacing of which is determined by the pressure for which the pipe is designed. Under the priorities that have been issued, I am not sure that it will not be as difficult to obtain wood pipe as it is to get metal pipe, because of the wire or the bands that must be used.

Asbestos cement pipe should provide a much more satisfactory and more permanent substitute for the iron and steel pipe than the wood pipe. Here again, however, we meet priorities and restrictions in the use of materials, for elbows, bends, tees and other fittings must be of iron, while rubber is required for the joint assembly. Either of these kinds of pipe uses so much less iron and steel, however, that the War Production Board may look with favor upon them, when it is convinced that the pipe is needed.

Hazards in Renewing Turnouts

What hazards are involved in the renewal of turnouts? What measures can be employed to overcome them?

Generally the Feet

By W. Woolsey

Section Foreman, Illinois Central, Chicago

Most of the accidents that occur in connection with the renewal of turnouts are injuries to the feet and toes. Primarily this is because it is necessary to handle an unusual amount of rail out of and into the track, as well as the frog and switch, both of which are heavy and awkward to handle, and it generally must be handled by hand, without the advantage of tongs. Spiking may be a fertile source of injury unless the supervision is good, for the men are working in a small area, and each is intent on his own task. There is a special hazard in spiking guard rails, since the spikes can seldom be driven to place without the aid of a follower, and it is not uncommon for the maul to strike the guard rail instead of the spike.

Only an experienced foreman and experienced trackman should be assigned to the renewal of turnouts. They should be given the proper tools for this class of work. Most important of all, all unnecessary talking should be prohibited. Every gang engaged in this type of work should have a gang leader who receives his instruction direct from the foreman, and is able to take part in any of the numerous operations involved. In a well-organized gang the foreman does no part of the work and issues instructions to no one but the gang leader, who transmits them to the men. This avoids confusion. It is just as easy to train a gang to do the work systematically and safely as to allow it to be done in a haphazard, slovenly and unsafe manner.

Requires Supervision

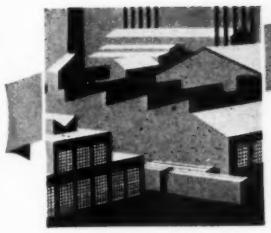
By District Engineer

There should be no special hazards connected with the renewal of a turnout, provided the supervision is capable and ample. Obviously, there are hazards connected with this work, but they should be no greater than those that attach to the handling of heavy materials and the use of swinging and prying tools elsewhere. However, a gang working on a turnout should contain as many men as can be worked effectively, and since they must work in a restricted area greater precautions and more intensive supervision become necessary.

Most injuries occur to the feet, although muscular strains are not uncommon. Much of the hazard can be eliminated if a crane can be assigned to the job to handle the rail, the frog and the switch points. Otherwise, they must be handled by hand. The rail can be handled with rail tongs, but the construction of the frog and points makes the use of the tongs difficult, and even hazardous. Owing to the restricted space and the many operations that must be conducted simultaneously when renewing a turnout, special attention should be given to getting the old rail out of the track and the new rail in.

Similarly, unusual care should be exercised in the handling of the frog and the points to get them into position, if this is a hand operation for, generally, they must be skidded into place. A frog should never be unloaded upside-down, particularly if it must be turned over by hand. Spiking can be a real source of injury where so many men are bunched, unless vigilant care is exercised. Another item that must be watched carefully is the use of lining bars, to avoid mashed fingers and to prevent the hazard of rupture.

That the hazards connected with the renewal of turnouts can be minimized and injuries prevented was impressed upon me forcibly some years ago when I was a track supervisor. I was in charge of a large and busy terminal for four years, where I inherited a special gang of 12 men who did no other work than renew turnouts. The foreman never accepted a man to fill a vacancy unless he was already an experienced trackman and spoke English. This was the least talkative gang I ever saw, and during the four years that I was on the terminal this gang never had a reportable injury.



PRODUCTS of Manufacturers

Claw Bar Safety Attachments

TWO new attachments, Simplex safety shields and hand guards, designed to increase the safety of use of the conventional type of claw bar, have been placed on the market by Templeton Kenly & Co., Chicago. Both devices are made of cast steel and can be easily welded in place on standard types of claw bars. The safety shield resembles the claw of the claw bar in appearance and is welded

A Conventional Type of Claw Bar With a Safety Shield Welded in Place on the Claw and a Hand Guard Welded to the Shank

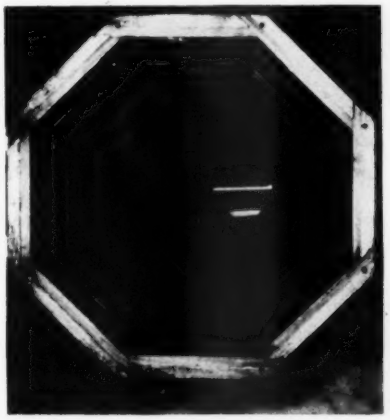
on just above the claw. This shield prevents accidents caused by the heads of brine-eaten spikes breaking off and striking track workers and also prevents complete spikes from flying loose suddenly when pulled from ties which have become rotted. An additional advantage of the safety shield is that it can be used for a second lift on the spike without the necessity of blocking under the heel of the claw bar. In this respect it saves time and back work on the part of the operator and aids in pulling spikes out straight, a worth-while feature in salvaging second hand spikes.

The hand guard is an arched bar welded to the lower side of the claw bar handle near the end. It prevents the operator from injuring his knuckles on the ballast or the other rail of the track in cases where spikes let go suddenly or the spike heads break off, causing him to come down on the ballast with the extra weight of the bar. Application of the hand guard does not interfere with the use of the claw bar for nipping ties or plates in gaging or tie renewal work.

Armco Emergency Pipe

TO solve the war time problem of building drainage structures that do not use critical materials, Armco Drainage Products Association, Middletown, Ohio, has developed Armco Emergency Pipe, a 100 per cent wood structure requiring no steel bands, nails, or metal reinforcing of any kind.

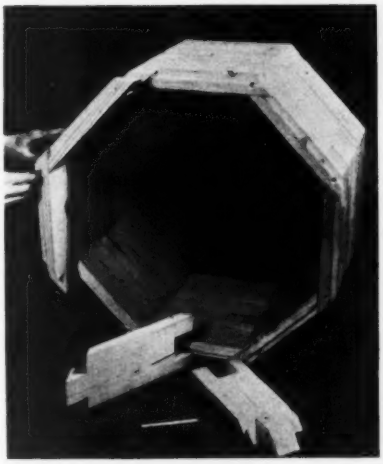
Armco emergency pipe is made up of short stout segments of wood, preframed with doweled and interlocking joints to form an octagonal or other polygonal shape. The pipes are usually shop assembled or fabricated in lengths of 12 ft. or more, which in turn are simply joined together in the field to make a single structure. To provide a service life longer than the probable shortage of critical materials, the wood segments are treated with a non-critical material to give the pipe a life materially exceeding that of timber untreated.



A Completely Assembled Pipe

The culverts are designed to be replaced readily with more permanent installations at the end of their service life by either threading corrugated metal pipes through them or by jacking corrugated metal pipe around them and then removing the old pipe structure.

Because of its flexibility, Armco Emergency Pipe is said to possess many of the structural characteristics of corrugated metal pipe. This flexibility enables it to build up side support which greatly increases its load-carrying capacity. The pipes are light in weight and may be installed easily by unskilled labor. They are constructed in various diameters with side walls 1-5/8 in. thick for diameters from 18 in. up to 36 in. The 48-in. and 60-in. pipe are constructed with



Showing How the Wood Segments Are Assembled with Dowel Pins to Form an Armco Emergency Pipe

side walls 2-1/8 in. thick and the 72-in. pipe with side walls 2-5/8 in. thick. The table shows the approximate weights and the end areas of various sizes of these pipes.

Weight and End Area of Armco Emergency Pipe

Diameter of pipe (in.)	Weight per foot of length (lbs.)	End area (sq. ft.)
18	29.6	1.9
24	38.6	3.3
30	47.6	5.2
36	56.4	7.5
48	102.8	13.2
60	126.2	20.7
72	192.0	29.8

Because Armco Emergency Pipe is constructed from short segments of timber, scrap pieces too short for use in other construction work may be used, and because these segments are joined together by dowels inserted in holes drilled for the purpose, no steel bands, nails or other metal reinforcing material is required.

What Our Readers Think

A Trackman's View of Superelevation

Chicago, Ill.

TO THE EDITOR:

Speeds have been increased during recent years to such an extent that they have added measurably to the cares of the trackman. This is true in greater measure where the traffic on a given track is decidedly mixed between high-speed passenger trains and slower tonnage freight trains, particularly where there are curves of 2 deg. or more. Obviously, these curves will give him more trouble than lighter curves and tangents, although neither can be ignored.

He knows that his curves will give him the least trouble when they neither lose nor gain superelevation under traffic. If a curve has 6 in. of elevation and it tends to settle on the low side, that is, gain superelevation, he knows that he must give it special attention. He is aware that the cross level, the gage and the line will all be affected. In other words, he knows that this is a curve that will not "stay put." Generally, the low rails on such a curve will tend to straighten or even take curvature in the wrong direction, thereby causing the joints to kink in. At the same time, the rails on the high side tend to increase their curvature, also causing the joints on these rails to kink in, while the center tends to move ("belly") out.

Again, because it becomes necessary to disturb the track so often, such a curve is likely to become loose, that is, have uneven bearing, and cause progressive troubles. Assign a trackman to a section having several such curves, and he is likely to spend most of his time on them.

A curve that loses superelevation under traffic is also bothersome. The high rail wears rapidly, and this wear is quite likely to be greatest at the points of full elevation, which also show a disposition to work outwardly and to be subject to some kinks. If these points are disturbed often, they are more prone to belly out or kink under high temperature.

On multiple-track lines, the elevation of the curves on the tracks carrying the up-hill movement is likely to increase while it will decrease on the down-hill tracks. On single track subject to mixed traffic, there is likely to be a loss of superelevation on the down-hill grades and a gain on the up grades in the direction of the heavier tonnage. To combat these situations, the trackman, as he surfaces around these curves, ordinarily increases the elevation slightly on the down grades and fudges a little the other way on the up grades.

In defense of this action, if any defense be necessary, it can be said that the trackman knows little and cares less about the fact that $E = 0.00066DS^3$ or even that $E = 0.00066DS^2 - 3$. If he knows anything about these two equations for superelevation, he probably prefers the second one, since it will probably come closer to correspondence with his practical experience.

Again, he knows from his practical experience that 6 in. is about the maximum elevation that will permit proper maintenance of track for all classes of traffic. He knows further that a business car, a Pullman car, a passenger coach or a baggage car will ride comfortably around a curve that has an elevation 3 in. less than that called for by the first of these equations, the so-called equilibrium formula. He has observed that his 1-deg. curve will ride smoothly at 87 miles an hour if the curve is elevated 2 in., and that his 2-deg. curves will be satisfactory for 73 miles an hour if the elevation is 4 in. He can maintain his light curves in satisfactory condition without difficulty, but when he hears of a passenger locomotive, having its center of gravity 84 in. above the rails, turning over on a curve of 7-deg. 24-min. which has been given 8 in. of superelevation, he wonders how much good these high superelevations do on sharp curves.

This does not imply that he is a "low-elevation" or a low-speed trackman. It is natural, however, that he should wonder, since his 6-deg. curves ride comfortably at 48 miles an hour with 6 in. of elevation, what good reason can be advanced for putting them up to 7 in., for the purpose of raising the speed limit to 50 miles an hour. The trackman should not be criticized for this attitude, for few, if any, engineers can distinguish between speeds of 48 and 50 miles an hour.

Another item that puzzles the practical trackman and disturbs his peace of mind is how he is to get on and off of highly elevated curves. Gradual and uniform changes in curvature are not uncomfortable or unpleasant. The A.R.E.A. spiral lengths for comfortable riding are calculated for a rise or drop on the runoff of 1¼ in. per second. On this basis it requires spirals 339 ft. long for a 6-deg. curve having 6 in. of superelevation and 472 ft. to get off of a 3-deg. curve having the same elevation, since the latter will have a comfortable speed of 67 miles an hour. Spirals of these lengths are seldom practicable.

From both experience and observation, the practical trackman sees little to recommend and much to oppose in superelevations greater than 6 in. for any curve. He takes the position that it is much better to limit the elevation to 6 in., and then restrict speeds to insure safe and comfortable riding than to increase the elevation above this amount, with the view of allowing faster operation around curves.

ENGINEER OF TRACK.

Why Not Differential Axles on Motor Cars?

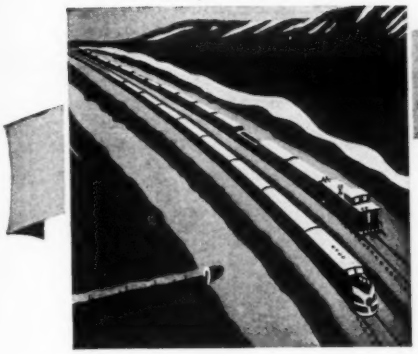
East Liberty, Pa.

TO THE EDITOR:

On pages 289 and 290 of the April, 1941, issue some interesting facts are given concerning the shimmying of motor cars. I have observed that much of this trouble originates by reason of the loose wheels having a straight bore. Where the hub is bored straight, it requires only a little wear to cause a lot of trouble. To start with, the wheel must be to a running fit, and the use of washers to bring it to gage is merely a makeshift. Observation will confirm that it requires only a small amount of play to cause severe blows to the box, which will, in turn, be transmitted to the frame.

From my point of view, we have been quite backward in that we have not at least tried out the differential axle. A differential axle will allow the wheels to be frozen on the axle and yet turn as freely as at present, and it should eliminate the end play which now affects so many cars. To me, the loose wheel has always been a source of trouble. For some unknown reason, it usually receives little attention; it is hard to lubricate, and if packed with grease the amount of wear that has taken place can be determined only by the removal of the wheel. While the first cost of the differential axle is greater than that of the plain axle we are now using, it should be cheaper in the long run. This is a subject worthy of considerable thought, and I would like to see some discussion of its merits.

D. MCHENRY,
Maintenance of Way Inspector,
Pennsylvania.



NEWS of the Month

Tank Car Movement Continues to Set New Records

The tank car movement of oil into the East Coast area soared to a new high average of 652,082 barrels per day during the week ending May 9. During the same week, however, oil shipments from California to Oregon and Washington dropped off from an average of 29,429 to 28,480 barrels per day. It is estimated that more than 45,000 tank cars are being used in the East Coast service and approximately 2,225 cars in Pacific Northwest service.

Railroads Face Labor Shortage

Based on a survey made by Otto S. Beyer, director of the Division of Transport Personnel of the Office of Defense Transportation, Joseph B. Eastman, director of ODT, indicated that the railroads will need approximately 320,000 new men in 1942. "Already facing an acute labor shortage in many departments of maintenance and operation, American railroads are now confronted with the necessity of finding enough men to fill an estimated 117,000 new jobs for the remainder of 1942," said a statement issued by the Office of Defense Transportation. Current estimates, the statement added, indicate that employment in war industries will increase from about 7,500,000 to about 15,000,000 men and that about 4,000,000 men will be needed in the armed forces by the end of this year, thereby further complicating the railroads' manpower problem."

Mr. Beyer's report indicates that aside from filling the 117,000 new jobs, 167,000 men will be needed to meet labor turnover, 22,000 more will be necessary to replace selectees, and 14,000 will be required to take care of vacations. This makes a total increase of 320,000 men needed by the railroads during the remainder of the year.

Travel Restrictions Near—Eastman

"The time is rapidly approaching, and in some areas is already here, when limitations upon passenger travel and public passenger service must be imposed," according to a May 3 statement of Director Eastman of the Office of Defense Transportation. "Last year highway buses carried about 15 billion intercity passenger miles; railroads, 25 billion; and private automobiles, over six times as many as the public carriers combined. The rubber and gasoline shortage restricting automotive travel is already diverting to the public carriers an increasing number of travelers who formerly depended on private cars. During the first few months of the war, travel over the public carriers has increased from 40 per cent to as much as 60 per cent in different areas. As a whole, the average is in excess of 50 per cent.

"In view of the extensive military movements and the increase in war freight traffic, much of this demand cannot be met by the public carriers. The Office of Defense Transportation is actively considering steps to conserve the use of present passenger facilities and at the same time restrict and limit passenger travel."

The statement continued by suggesting elimination of high-speed duplicating service on competing lines, lengthening of limited schedules to include more stops, and the reduction or total elimination of all luxury equipment for the duration.

ODT Requests Southwestern Roads to Spread M. of W. Work

On May 9, Joseph B. Eastman, Defense Transportation Director, appealed to the eight major railroads serving the Southwest to spread their maintenance-of-way work so that peak railway labor needs will cease to conflict with peak demands for farm labor. Mr. Eastman's letter to the rail executives resulted from a report compiled by Otto S. Beyer, Director of ODT's Transport Personnel division, which said that "maintenance-of-way operations in the Southwest are scheduled with less regard for the months of peak demand for agricultural labor than would be desirable in the interests of both the railroads and agriculture."

A check made by Mr. Beyer showed that in 1941 the Santa Fe, the Southern Pacific, the Missouri Pacific, the Missouri-Kansas-Texas, and the St. Louis Southwestern used over 50 per cent more section and extra gang laborers during August, September, October, and November than at any other time during the year—a period when the farm sections served by these roads have the greatest need for workers. "In general," said the report, "these railroads are using the greatest number of maintenance-of-way workers when they are hardest to recruit, and the least number when they should be easiest to recruit."

Calling attention to the mild weather prevalent in the Southwest through the winter months, Mr. Eastman asked that the railroads plan as much track and roadbed work as possible from January through the spring and early summer months when agriculture's demands are low. He suggested that maintenance-of-way officers check with the U. S. Employment Service in their districts to determine when local peak demands for farm labor are likely to be reached. In the years previous to the war, and especially in the depression years, Mr. Eastman said, southwestern railroads faced no particular labor problem in the autumn months, but now, with manpower an increasingly important factor, every effort must be made to make the supply go around.

Military Railway Service Headquarters Activated

Headquarters for the Military Railway Service was opened at Fort Snelling, Minn., on May 15. Colonel Carl R. Gray, Jr., Engineer Reserves, formerly executive vice-president of the Chicago, St. Paul, Minneapolis & Omaha, has been called to active duty and is in charge of training all men for the Military Railway Service. Previously, one shop and four operating battalions had been activated. Another operating battalion and the engineering headquarters staff were activated on May 15. Ultimately, between 30,000 and 35,000 railroad workers and officers will be enlisted in the 42 operating battalions, 6 shop battalions, 10 grand division headquarters and 1 engineering headquarters, contemplated.

Major railroads of the United States are cooperating in the establishment of the Military Railway Service, Corps of Engineers. Initially, the Southern, the Atchison, Topeka & Santa Fe and the Pennsylvania each will train an engineer battalion (railway operating), while the New York Central will train an engineer battalion (railway shop). In addition to the four battalions to be trained by the railroads, the Corps of Engineers is training a battalion in Louisiana.

The officer personnel of the engineering department of the Military Railway Service is as follows:

Eng. m. of w.—Lt. Col. B. H. Crosland, div. eng., St. L. S. F., Ft. Scott, Kans.
Eng. m. of track—Maj. E. T. Barrett, div. eng., D. & R. G. W., Pueblo, Colo.
Eng. m. of bridges—Maj. R. E. Sherer, div. eng., M. St. P. & S. S. M., Minneapolis, Minn.
Eng. m. of sig.—Maj. J. R. Scatterday, div. eng., C. & O., Huntington, W. Va.
Supv. water serv.—1st Lt. R. C. Carrick, chem. eng., R. F. & P., Richmond, Va.
Supt. wk. equip.—Capt. E. P. Sima, supv. wk. equip., C. M. St. P. & P., Seattle, Wash.
Asst. eng. track—1st Lt. R. A. Sharood, rd. mast., N. P., Missoula, Mont.

Association News

Railway Tie Association

More than 100 executives of the producing companies and railway officers gathered at Cincinnati, Ohio, on May 6-7 for the twenty-fourth annual meeting of this organization. The program was directed to the war-time problems of production and was the most constructive in the history of this organization with numerous addresses by both railway officers and tie producers. Abstracts of a number of these papers will be presented in later issues. David W. Bauer, vice-president of the Potosi Tie and Lumber Company, St. Louis, was elected president and Roy Edmunds was re-elected secretary-treasurer.

Track Supply Association

At a meeting of the board of directors of the Track Supply Association in Chicago on April 27, it was decided to proceed with plans for the 28th annual exhibit at the Stevens Hotel, Chicago, on September 14-17, coincident with the convention of the Roadmasters and Maintenance of Way Association. In taking this action, the directors were prompted by the belief that through their exhibit, they can make a constructive contribution to the convention by giving the many new men in official positions, an opportunity to see the new products that will be on display, explain any substitutions that present conditions may make necessary and instruct those attending in the proper and economical use of equipment to extend its life where it is difficult to obtain. Applications for space were mailed to prospective members on May 11, and a very satisfactory response has been received to date.

Committees appointed by President Blackburn to plan for the exhibition were as follows: publicity, H. W. Cutshall, Electric Tamper and Equipment Company; entertainment, C. O. Jenista, Barco Manufacturing Company; membership, Thomas D. Crowley, Creepcheck Company, Inc.; hotel, H. C. Hickey, Rail Joint Company.

Metropolitan Maintenance of Way Club

THE club held its annual meeting at the Hotel Governor Clinton, New York, on April 30, with 60 members and guests in attendance. Following dinner, the meeting was addressed by A. A. Cross, division engineer of the New York, New Haven & Hartford, at Hartford, Conn., who described the experiences of his company with crawler cranes equipped with flanged-wheel mountings. The program also included the presentation of a moving picture in color, showing the cranes in use for laying rail and other purposes.

In the election of officers, Lee Spencer, track supervisor, Long Island, was advanced from first vice-president to president; Blair Blowers, division engineer, Erie, was elected first vice-president; A. J. Flannagen, assistant division engineer, New York Central, was named second vice-president; and M. H. Dick, eastern editor, *Railway Engineering and Maintenance*, was re-elected secretary-treasurer. Members elected to the Executive Committee are J. M. Reardon (retiring president), supervisor of track, New York, New Haven & Hartford; Harry Jones, engineer maintenance of way, Lehigh & New England; E. T. Lederman, roadmaster, Delaware, Lackawanna & Western; and S. A. Congdon, Jr. (re-elected), Chicago Pneumatic Tool Company.

American Railway Engineering Association

Especially in the light of the many new problems being presented to engineering and maintenance officers as the result of the war, the activities of the association moved forward with increased zeal during the last month. Among these activities, emergency committees of the association, acting for the Construction and Maintenance section of the Association of American Railroads, and working with special committees of the War administration in Washington, approved and issued to all member roads during the last week in May, emergency provisions for existing specifications for open-hearth steel rails; for both medium carbon steel and hot-worked, high-carbon steel tie plates; for soft steel and high-carbon steel cut track spikes; and for heat-treated carbon steel and alloy steel track bolts.

In all of these emergency provisions, except for rails and bolts, the object is to eliminate reference to copper content. In the case of rail, the object is to make such modifications as will simplify the general adoption of these specifications by the railways. The modifications in the specifications for track bolts eliminate reference to alloy steel.

Three standing committees of the association held meetings in May, as follows: Rail, at Chicago, on May 7; Iron and Steel Structures, at Columbus, Ohio, on May 14 and 15; and Wood Bridges and Trestles, at Chicago, on May 21. Five committees have thus far scheduled meetings during June, these being as follows: Buildings, at Richmond, Va., on June 9 and 10; Roadway, at Chicago, on June 15 and 16; Economics of Railway Location and Operation, at Cleveland, Ohio, on June 18 and 19; Water Service, Fire Protection and Sanitation, at Chicago, on June 23; and Yards and Terminals, at Buffalo, N. Y., on June 24.

The 1942 Proceedings of the association, covering the activities at the convention in March, will be distributed to members about the middle of June, and it is expected that the loose-leaf supplement pages for the Manual, incorporating changes resulting from the activities of the last convention, will be distributed to holders of the Manual shortly after the middle of the month.

Personal Mention

General

Elmer L. Anderson, whose promotion to assistant to the general manager on the St. Louis-San Francisco, with headquarters at Springfield, Mo., was reported in the May issue, was born at Hull, Ill., on October 20, 1888, and graduated in civil engineering from the University of Missouri in 1912. He entered the service of the Frisco on December 28 of the same year, serving as a rodman and transitman until May 1, 1916, when he was advanced to assistant engineer. From September 4, 1917, to July 1, 1919, he served in the United States Army, returning on the latter date to the Frisco as an assistant engineer. On September 1, 1928, he was promoted to division engineer, returning to the position of assistant engineer on September 1, 1929. From December 1, 1931, until November 1, 1937, he served as a roadmaster and on the latter date he was promoted to division engineer, with headquarters at Springfield, which position he held until his recent promotion.

William A. Mather, general manager of the Western lines of the Canadian Pacific, with headquarters at Winnipeg, Man., and an engineer by training and experience,

William A. Mather

has been promoted to vice-president of the Western lines, with the same headquarters. Mr. Mather was born at Oshawa, Ont., on September 12, 1885, and attended McGill University. He entered railway service in May, 1903, in the construction department of the Canadian Pacific and in January, 1911, he became resident engineer at Winnipeg. In March of the following year Mr. Mather was promoted to sunperintendent at Kenora, Ont., later being transferred to Medicine Hat, Alta. In June, 1915, he was advanced to assistant general superintendent of the British Columbia district, and was later promoted to general superintendent of the Saskatchewan district. In December, 1932, he was transferred to the Alberta district and in 1933 he was appointed assistant to the vice-president, with headquarters at Montreal. In September, 1934, Mr. Mather was advanced to general manager of the Western lines,

with headquarters at Winnipeg, which position he held until his recent promotion.

L. K. Sorensen, general superintendent on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Milwaukee, Wis., and a maintenance officer by training and experience, has been promoted to assistant general manager at Chicago. **H. C. Munson,** division superintendent at La Crosse, Wis., and an engineer by training and experience, has been advanced to general superintendent at Milwaukee, replacing Mr. Sorensen. Mr. Sorensen entered the service of the Milwaukee on August 14, 1907, as a carpenter at Savanna, later being transferred to Harlowton, Mont. On October 15, 1916, he was promoted to bridge and building foreman at Harlowton and on November 1, 1919, he was advanced to chief carpenter, with the same headquarters. Mr. Sorensen was promoted to trainmaster at Aberdeen, S.D., on November 5, 1925, and was advanced to superintendent at Deer Lodge, Mont., on February 1, 1927, later being transferred successively to Butte, Mont., and Tacoma, Wash. In December, 1940, Mr. Sorensen was promoted to general superintendent, with headquarters at Milwaukee.

Mr. Munson was born at Oslo, Norway on June 25, 1901, and graduated in civil engineering from the State University of Iowa in June, 1923. He entered railway service on June 6, 1923, as a rodman on construction work on the Milwaukee at Momence, Ill., and in October, 1923, he was advanced to instrumentman at Marion, Iowa, later being transferred to Chicago. In April, 1928, he was promoted to assistant engineer at Chicago, and in March, 1929, he was advanced to division engineer, with headquarters at Sioux City, Iowa. Mr. Munson was promoted to trainmaster, with headquarters at Ottumwa, Iowa, on April 1, 1931, later being transferred successively to Savanna and La Crosse, Wis. He was later advanced to assistant superintendent at Wausau, Wis., and then to superintendent at Austin, Minn. In October, 1939, Mr. Munson was transferred to Savanna and in December, 1940, he was transferred to La Crosse, where he remained until his recent promotion.

Engineering

H. A. Wistrich, engineer maintenance of way of the Lehigh Valley at Bethlehem, Pa., has been appointed assistant chief engineer, construction-maintenance.

W. T. Alexander, principal assistant engineer of the Gulf Coast Lines and the International Great Northern (Missouri Pacific), with headquarters at Houston, Tex., has been appointed assistant chief engineer of the Texas & Pacific, a newly created position, with headquarters at Dallas, Tex.

W. A. Trimble, assistant division engineer of the Middle division of the Pennsylvania, with headquarters at Altoona, Pa., has been promoted to division engineer of the Erie & Ashtabula division, with headquarters at New Castle, Pa. **C. R. Montgomery,** supervisor of track on the Eastern division, with headquarters at Mansfield, Ohio, has been promoted to assistant division engineer of the Middle division to succeed Mr. Trimble.

A. D. W. Cuthbert, division engineer of the Cochrane division of the Canadian National, with headquarters at Cochrane, Ont., has been transferred to the Laurentian division, with headquarters at Quebec, Que., succeeding **G. E. Corriveau,** who has been appointed acting division engineer at Cochrane to replace Mr. Cuthbert.

Harold W. Legro, whose appointment as engineer of grade crossings of the Boston & Maine, with headquarters at Boston, Mass., was reported in the April issue, was born at Lynn, Mass., on November 25, 1888. Mr. Legro studied engineering by means of various special courses and entered railway service with the B. & M. on June 3, 1907, as a rodman, later serving as transitman, inspector and instrumentman until January 1, 1918. At that time, he became assistant track supervisor, holding this position until January 15, 1921, when he was appointed assistant engineer of the Portland division. On January 16, 1928, he became acting supervisor of bridges and buildings on the same division, holding this position until February 1, 1928, when he became industrial engineer at Boston. When that position was abolished on February 1, 1939, Mr. Legro became assistant division engineer of the Terminal division at Boston, which position he held until his recent appointment, effective March 16.

Harold W. Legro

F. A. Roberts, who has been on the staff of the division engineer of the Kent division of the Erie, with headquarters at Marion, Ohio, has been promoted to assistant division engineer of the Marion division, with headquarters at Huntington, Ind., to succeed **Arthur E. Price,** whose transfer to Hornell, N.Y., was reported in the May issue.

G. M. Darby, division engineer on the Denver & Rio Grande Western at Pueblo, Colo., has been promoted to engineer of track, with headquarters at Denver, Colo., and **G. S. Turner,** roadmaster at Helper, Utah, has been advanced to division engineer at Pueblo, succeeding Mr. Darby.

Stewart Clarke, Jr., office engineer at Salt Lake City, Utah, has been appointed assistant engineer at that point, replacing **John B. Harvey,** whose promotion to roadmaster at Walsenburg, Colo., is reported elsewhere in these columns, and **T. F. Buirgy,** engineering assistant at Grand Junction, Colo., has been promoted to office engineer at Salt Lake City, relieving Mr. Clarke.

George T. Donahue, whose promotion to division engineer of the Western and West divisions of the New York Central, with headquarters at Chicago, was reported in the April issue, was born at Watertown, N.Y., on July 6, 1890, and graduated in civil engineering from Ohio State University in 1915. He obtained his first railway service in the maintenance of way department of the Chicago, Burlington & Quincy at Lincoln, Neb. On September 16, 1916, he entered the service of the New York Central as a transitman at Rochester, N.Y., and on May 16, 1918, he was appointed assistant supervisor of track at Rochester. Mr. Donahue was promoted to assistant division engineer at Rochester on December 1, 1925, and on April 1, 1929, he was transferred to Syracuse, N.Y. On November 1, 1929, he was appointed supervisor of track at Waterton, N.Y., later being transferred to Richland, N.Y. On November 1, 1934, he was transferred to New York, in charge of the West Side improvements and three years later he was promoted to special engineer in the office of the engineer maintenance of way of the system at New York, which position he held until his recent promotion, effective April 1.

Stanley G. Phillips, whose promotion to engineer maintenance of way of the Maine Central and the Portland Terminal at Portland, Me., was reported in the May issue, was born on February 26, 1895, at Westbrook, Me., and was graduated from the University of Maine in 1917. He entered the service of the Lehigh Valley as a rodman in 1917 and, after serving overseas with the United States Army Engineers from 1917 to 1919, he returned to the Lehigh Valley, serving successively as assistant division engineer and track supervisor. In 1929 he was appointed track supervisor of the Central of New Jersey. Mr. Phillips entered the service of the Boston & Maine in November, 1929, as assistant division engineer of the Terminal division and in 1939 he was promoted to division engineer, which position he held until his recent promotion.

Stanley G. Phillips

Hans F. Bober, whose promotion to assistant engineer of bridges of the Chicago, Rock Island & Pacific, with headquarters at Chicago, was reported in the April issue, was born at Dartmouth, N.S.,

Hans F. Bober

on October 18, 1892, and graduated from Nova Scotia Technical College, Halifax, N.S., in 1911. He entered railway service on the Rock Island in 1914 and a year later went with the Elgin, Joliet & Eastern as a draftsman and designer. During the first World War he served with the 33rd Engineers of the U. S. Army, afterwards returning to railroad service as a designer for the Rock Island. From 1922 to 1935 Mr. Bober served successively as masonry inspector, resident engineer on construction work and bridge inspector. In 1936 he was promoted to district supervisor of bridges and in 1938 he was advanced to assistant engineer with headquarters at Chicago, which position he held until his recent promotion.

John M. Podmore, whose retirement on April 30 as division engineer on the New York Central, with headquarters at Toledo, Ohio, was reported in the April issue, was born at South Norwalk, Conn., on April 2, 1872, and graduated from Rensselaer Polytechnic Institute in 1896.

John M. Podmore

He entered railway service on June 10, 1898, as a rodman on the New York Central at Albany, N.Y., later being promoted to instrumentman. In January, 1901, he was appointed assistant supervisor of bridges and buildings at Weehawken, N.J., and a year later, he was appointed assistant engineer at Buffalo, N.Y. Mr. Podmore was promoted to supervisor of track at Kingston, N.Y., in August, 1903, and in November, 1909, he was advanced to division engineer at Watertown, N.Y. In January, 1910, he was transferred to Oswego, N.Y., and in March, 1917, he was transferred to Toledo.

E. H. Barnhart, whose promotion to division engineer on the Baltimore & Ohio at Garrett, Ind., was reported in the April issue, entered the service of the B. & O. as assistant on the engineer corps at New Castle, Pa., on March 1, 1907, and on September 15, 1910, he was appointed assistant division engineer at New Castle. He was promoted to division engineer at Parkersburg, W. Va., on February 1, 1916, and transferred to Wheeling, W. Va., on October 16, 1916. He then became assistant engineer on the Eastern lines and on July 16, 1918, he was appointed special engineer at Baltimore, Md. On May 1, 1924, he was made industrial engineer, and on June 6, 1932, was appointed assistant division engineer at Cincinnati, Ohio. Later the same year, he was transferred

E. H. Barnhart

to Dayton, Ohio, and on July 16, 1936, he was advanced to division engineer at that point. On March 20, 1938, Mr. Barnhart was appointed assistant division engineer and on May 1, 1940, he was advanced to general bridge inspector of the Western lines.

Benjamin E. Valde, roadmaster on the Canadian National at Burns Lake, B.C., has been promoted to assistant division engineer at Prince George, B.C. Mr. Valde was born at Portage La Prairie, Man., on June 4, 1898, and graduated from Manitoba University in 1924. He entered railway service in September, 1915, as a clerk in the roadmaster's and superintendent's office of the Canadian National at Winnipeg, Man., and a year later was appointed a chainman at that point. From May, 1918, to October, 1918, he served as a leveller and steel inspector and from June, 1919, to August, 1919, he served as a signal fitter on the Canadian Pacific at Field, B.C., and Glacier, returning to the Canadian National in May, 1920, as a rodman at Winnipeg. He later served as a timekeeper, rodman and instrumentman on construction and in July, 1924, he became an instrumentman for the Reclamation department of the Province of Manitoba. Mr. Valde returned to the Canadian National in September, 1925, as an instrumentman at Prince Rupert, B.C., later being transferred to Prince George, B.C. In December, 1940, he was promoted to roadmaster at Burns Lake.

John F. Reilly, whose promotion to assistant division engineer of the Fitchburg division of the Boston & Maine, with headquarters at Greenfield, Mass., was announced in the April issue, was born at Valley Falls, N. Y., on October 20, 1883. After a public school education, he entered railway service with the B. & M. on August 1, 1901, as a trackman, being promoted to section foreman on December 27, 1904. On January 13, 1913, he became a yard foreman, and on January 2, 1922, he was appointed extra crew foreman. On May 2, 1926, Mr. Reilly was promoted to assistant track supervisor, being further advanced to track supervisor on April 1, 1927. He became acting assistant division engineer on August 1, 1940, which position he was holding at the time of his recent appointment as assistant division engineer, effective March 16.

Clarence Baker, whose promotion to assistant division engineer on the Gulf Coast Lines (Missouri Pacific) at DeQuincy, La., was reported in the May issue, has been promoted to principal assistant engineer of the Gulf Coast Lines and the International-Great Northern, with headquarters at Houston, Tex., succeeding **W. T. Alexander,** whose appointment as assistant chief engineer of the Texas & Pacific, with headquarters at Dallas, Tex., is reported elsewhere in these columns. Mr. Baker was born at Carbondale, Ill., on July 16, 1902, and graduated from Rice Institute, Houston, in 1924. He first entered railway service on June 1, 1922, serving as a chainman on the Missouri Pacific at Houston during a summer vacation from school and the following summer he worked as a gravel inspector. He entered permanent employment with the same road on June 4, 1924, as a transitman at Kingsville, Tex., and later served as a rodman at Edinburg, Tex., a transitman at Raymondville, Tex., and a resident engineer on construction at various locations in the Rio Grande valley. On January 1, 1930, Mr. Baker was promoted to assistant engineer at Kingsville, Tex., and on June 1, 1940, he was appointed roadmaster at Harlingen, Tex. Three months later, he returned to Kingsville as assistant engineer and on March 9, 1942, he was advanced to assistant division engineer at DeQuincy, the position he held until his recent promotion, effective May 8.

Paul H. Croft, whose promotion to division engineer on the Illinois Central, with headquarters at Water Valley, Miss., was reported in the April issue, was born at Fulton, Ky., on December 22, 1892, and graduated in civil engineering from the University of Kentucky in 1914. He entered railway service on May 1, 1914, as a chainman on the Illinois Central at Fulton and on August 16, 1915, he was promoted to rodman at Carbondale, Ill., being transferred back to Fulton two

months later. On April 15, 1916, he was promoted to instrumentman and on November 6, 1918, he was appointed assistant engineer at Clinton, Ill. Mr. Croft returned to Fulton as instrumentman on August 1, 1919, and on August 15, 1921,

Paul H. Croft

he was transferred to construction work at Johnston City, Ill. On December 1, 1921, he was promoted to assistant engineer in the office of the chief engineer at Chicago and on February 15, 1922, he was promoted to track supervisor at Dyersburg, Tenn. He was transferred to Christopher, Ill., in 1924, to Centralia, Ill., in 1930 and to East St. Louis, Ill., in 1934. On September 10, 1941, Mr. Croft was advanced to acting division engineer at Clinton, which position he held until his recent promotion, effective March 15.

Track

George Caraboa, section foreman on the New York Central (Big Four), has been promoted to assistant supervisor of track at Kankakee, Ill.

W. W. Clarke has been appointed track supervisor on the Southern at Tuscaloosa, Ala., succeeding **C. C. Mullen,** who has been granted a leave of absence to enter military service.

J. Walter Cozzens, assistant supervisor of track on the Pennsylvania at Columbus, Ohio, has been promoted to main line assistant supervisor of track on Subdivision No. 82, at Wilmington, Del.

J. O. Meshewilk has been appointed acting roadmaster on the Canadian National, with headquarters at Burns Lake, B.C., succeeding **B. E. Valde,** whose appointment as assistant division engineer at Prince George, B.C., is reported elsewhere in these columns.

E. W. Scott, general foreman on the Erie, with headquarters at Kent, Ohio, has been promoted to track supervisor, with headquarters at Salamanca, N.Y., to replace **W. L. Hoffman,** who has been transferred to Cuba, N.Y., to succeed **Peter J. Keenan,** whose death is noted elsewhere in these columns.

John B. Harvey, assistant engineer on the Denver & Rio Grande Western at Salt Lake City, Utah, has been promoted to roadmaster at Walsenburg, Colo., succeeding **H. P. Lessler,** who has been transferred to Helper, Utah, replacing **G. S. Turner,** whose promotion to division engineer at Pueblo is reported elsewhere in these columns.

Charles J. Morrell, extra gang and work train foreman on the Central Vermont, has been appointed roadmaster on the St. Johnsbury & Lake Champlain, with headquarters at Morrisville, Vt., succeeding **W. W. Coombs,** who, after nearly 50 years service, has been made inspector of track.

H. E. Michael, supervisor of track on the Pennsylvania, with headquarters at Camden, N. J., has been transferred to the Eastern division, with headquarters at Mansfield, Ohio, succeeding **C. R. Montgomery,** whose appointment as assistant division engineer is noted elsewhere in these columns. **A. B. Lewis,** supervisor in the office of the vice-president in charge of operation, with headquarters at Philadelphia, Pa., has been appointed supervisor—construction on the Philadelphia Terminal division.

R. M. Hanson, transitman on the New York Central at Toledo, Ohio, has been appointed assistant supervisor of track at Kalamazoo, Mich., succeeding **James C. Houston,** whose promotion to supervisor of track at Columbus, Ohio, was reported in the April issue. **E. B. Humphrey,** assistant supervisor of track at Youngstown, Ohio, has been transferred to Dunkirk, N.Y., and **R. W. Barrett,** levelman in the division engineer's office at Erie, Pa., has been appointed assistant supervisor of track at Youngstown, relieving Mr. Humphrey.

J. Manson, section foreman at Alexander, Man., has been promoted to roadmaster at Virden, Man., replacing **A. Holstrom,** who has been transferred to Minnedosa, Man. Mr. Holstrom succeeds **W. Cooper,** who has been transferred to Fort William, relieving **M. J. Skillen,** who was granted a leave of absence on May 8 because of illness.

P. S. Settle, assistant supervisor of track on the Maryland division of the Pennsylvania, has been promoted to supervisor of track at Logansport, Ind., succeeding **W. T. Rice,** who has been granted a leave of absence to enter military service. **Charles P. Willis,** draftsman on the Renovo division at Erie, Pa., has been promoted to supervisor of track at Kalamazoo, Mich., relieving **H. M. Curtiss,** who has also been granted a leave of absence to enter military service.

H. Brown, a relief roadmaster on the Canadian Pacific, has been promoted to roadmaster at Manyberries, Alta., succeeding **Olaf Erickson,** who has been transferred to Macleod, Alta., replacing **W. Christianson,** whose death on April 11 is reported elsewhere in these columns. **W. Mikkelson,** a roadmaster on the British Columbia district has been transferred to Proctor, B.C., relieving **T. W. Hicks,** who has been assigned to other duties at Saskatoon, Sask. **F. Stapley,** section foreman and relief roadmaster on the Saskatchewan district, has been promoted to roadmaster at Prince Albert, Sask., succeeding **A. E. Sharpe,** who retired from active service on April 30. **D. C. McLeod,** section foreman, has been advanced to temporary roadmaster at Ignace, Ont., relieving **D. M. Dunlop,** who has been placed in charge of the construction of a new yard at Fort William, Ont.

Whitcomb Haynes, whose promotion to track supervisor on the New Hampshire division of the Boston & Maine, with headquarters at Concord, N. H., was announced in the April issue, was born on June 15, 1907, at Ellsworth, Me. He graduated from the University of Maine in 1928, with the degree of bachelor of science in civil engineering, and entered railway service as assistant track supervisor on the Maine Central, with headquarters at Mattawamkeag, Me., in January, 1930. Mr. Haynes served in this capacity at various points, including Brunswick, Me., and Lewiston, until his recent promotion to track supervisor, which was effective on March 16.

Frank H. Mason, whose promotion to track supervisor on the Boston & Maine, with headquarters at Greenfield, Mass., was announced in the April issue of *Railway Engineering and Maintenance,* was born on October 8, 1900, at Gardner, Mass. After a public school education, he entered railway service as a trackman on the B. & M. in June, 1917. In June, 1925, he was promoted to extra gang foreman on the Fitchburg division, remaining in that position until March, 1937, when he was appointed yard foreman at Fitchburg, Mass. In November, 1938, he was sent to the Terminal division at Boston as general foreman, and in August, 1940, he was appointed acting track supervisor at Greenfield, Mass., which position he held until his recent promotion.

Arthur A. McMullen, whose promotion to track supervisor on the New Hampshire division of the Boston & Maine, with headquarters at Concord, N. H., was announced in the April issue, was born on August 22, 1907, at Lowell, Mass. After a public school education, he entered railway service in August, 1925, as a trackman and timekeeper on the B. & M. at Lowell, Mass. Mr. McMullen served in these capacities until April, 1931, except during the working seasons of 1929 and 1930, when he served as an extra gang foreman on ballasting work on the Fitchburg division. At the end of this period, he was appointed acting section foreman at Winchester, Mass., being made assistant foreman in September, 1931. In June, 1933, he resumed the position of extra gang foreman, which he held until August, 1940, when he was advanced to assistant track supervisor on the New Hampshire division at Concord, N. H., becoming supervisor of construction at Lowell, Mass., in August, 1941. In November, 1941, Mr. McMullen returned to Concord as assistant track supervisor, which position he held until his recent promotion to track supervisor, effective March 16.

James C. Houston, whose promotion to supervisor of track on the New York Central, with headquarters at Columbus, Ohio, was reported in the April issue, was born at Covington, La., on October 23, 1908, and graduated from the Uni-

versity of Michigan in 1931. He entered railway service in April, 1934, as a draftsman on the New York Central (Michigan Central) at Jackson, Mich., later being advanced to instrumentman. In January, 1937, he was transferred to grade separation work and in March, 1938, he returned to Jackson. Mr. Houston was promoted to assistant supervisor of track at Kalamazoo, Mich., in April, 1939, which position he held until his recent promotion.

Clyde Louis Conley, whose promotion to roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at La Junta, Colo., was reported in the April issue, was born at Holly, Colo., on December 21, 1898, and entered railway service in October, 1918, as a section laborer on the Santa Fe. On July 1, 1920, he was promoted to section foreman at Prowers, Colo., and then served as section foreman and extra gang foreman at various points on the Colorado division until May 1, 1940, with the exception of a short period in 1937 when he served as acting roadmaster at Pueblo, Colo., and another period in 1940, as acting roadmaster at Syracuse, Kan. On May 1, 1940, Mr. Conley was promoted to track supervisor at Lamar, Colo., which position he held until his recent promotion, effective March 15.

Archer S. Deaner, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Toledo, Ohio, was reported in the April issue, was born at Richmond, Va., on June 1, 1911, and graduated in civil engineering from the Virginia Polytechnic Institute in 1934. He went to work for the E. I. Du Pont Company in June, 1934, as an area engineer on plant construction at Richmond, Va., and two years later, entered railway service as an apprentice engineer for the Pennsylvania at Johnstown, Pa., later being transferred to Buffalo, N.Y. In March, 1937, he was promoted to assistant on the engineering corps at East Liberty, Pa., and seven months later, he was transferred to Carnegie, Pa. Mr. Deaner was furloughed in May, 1938, and worked as a junior draftsman for the Pennsylvania State Highway Department until February, 1939, when he returned to the Pennsylvania as assistant on the engineer corps at Pittsburgh, Pa., later being transferred successively to Emporium, Pa., Erie, and Philadelphia. In November, 1940, he was promoted to assistant supervisor of track at York, Pa., and in February, 1941, he was transferred to Perryville, Md., where he remained until his recent promotion.

John E. Chubb, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Cincinnati, Ohio, was reported in the April issue, was born at Edgewood, Pa., on July 12, 1912, and graduated in civil engineering from Ohio State University in 1935. He entered railway service on June 20, 1935, as a trackman on the Columbus division of the Pennsylvania at Columbus, Ohio, being appointed apprentice at Lewistown several weeks later. On February 1, 1936, he was transferred to Baltimore, Md., and one month later he was promoted to assistant on the engineer corps, later being transferred successively to Huntingdon, Pa., Philadelphia and the Eastern region rail-laying train. Mr. Chubb was promoted to assistant supervisor of track at Buffalo, N.Y., on May 10, 1937, and on April 4, 1938, he was appointed assistant on the engineer corps at Johnstown, Pa., later serving on temporary assignments at Pittsburgh, Pa., Dunkirk, N.Y., and Olean. On August 1, 1939, he was promoted to assistant supervisor of track at Enola, Pa., and was transferred to Wilmington, Del., on June 1, 1940, and to Philadelphia on August 15, 1941, remaining at the latter point until his recent promotion, which was effective on February 15.

Bridge and Building

J. J. Caldwell, assistant master carpenter of the Williamsport division of the Pennsylvania, has been promoted to master carpenter of the Buffalo division, with headquarters at Buffalo, N. Y.

Hamilton M. Dick, assistant master carpenter on the Pittsburgh division of the Pennsylvania, has been promoted to master carpenter of the Toledo division, with headquarters at Toledo, Ohio, succeeding **J. W. Rowland,** who has been transferred to the Long Island Railroad as reported in the May issue.

W. G. Park, student apprentice on the Southern, has been promoted to assistant supervisor of bridges and buildings at Hattiesburg, Miss., succeeding **J. T. Roberts,** who has been transferred to Louisville, Ky. Mr. Roberts relieves **V. E. Williams,** who has been granted a leave of absence to enter military service.

Robert Downard, formerly with the engineering department of the U. S. Government at Fort Knox, Ky., has been appointed supervisor of bridges and buildings on the Illinois Central at Paducah, Ky., succeeding **G. E. Martin,** whose promotion to superintendent of water service, with headquarters at Chicago, is reported elsewhere in these columns.

A. P. Reese, whose promotion to supervisor of bridges and buildings on the Southern Pacific Lines in Texas and Louisiana, with headquarters at Ennis, Tex., was reported in the April issue, was born at Yoakum, Tex., on June 20, 1902, and studied civil engineering for two years at Texas A. & M. He entered railway service as a rodman on the Southern Pacific Lines in Texas and Louisiana at Ennis on October 30, 1924, and was promoted to instrumentman on April 30, 1925, and to draftsman on October 1, 1926. A year later he was transferred to the New Orleans (La.) terminals and on October 1, 1934, he was appointed supervisor of bridges and buildings of the New Orleans terminals. Mr. Reese was appointed assistant supervisor of bridges and buildings at Ennis on April 8, 1936.

M. C. Morphew, whose promotion to supervisor of bridges and buildings on the Illinois Central, with headquarters at Waterloo, Iowa, was reported in the April issue of *Railway Engineering and Maintenance*, was born at Melvin, Ill., on May 21, 1894, and attended the University of Dubuque, Iowa. He entered railway service on January 2, 1917, as a rodman on construction for the Illinois Central at Dawson Springs, Ky. In March, 1919, he was promoted to instrumentman in the maintenance of way department at Ft. Dodge, Iowa, and in October, 1931, he was transferred to Paducah, Ky. Mr. Morphew was appointed a bridgeman at Chicago in September, 1932, and in July, 1933, he went with the D. & D. Bridge Company, Dubuque, Iowa, as bridge engineer, returning to the Illinois Central in March, 1936, as a rodman at Waterloo. In October, 1939, he was promoted to general foreman of bridges and buildings on the Iowa division, which position he held until his recent promotion.

Water Service

E. A. Johnson, water service foreman on the Chicago & Eastern Illinois, has been promoted to supervisor of water service at Danville, Ill., succeeding **J. H. Lesch,** whose death on April 21 was reported in the May issue.

G. E. Martin, supervisor of bridges and buildings on the Illinois Central, with headquarters at Paducah, Ky., has been promoted to superintendent of water service, with headquarters at Chicago succeeding **Clarence R. Knowles,** who retired from active scervice on May 1. Mr. Martin was born at Princeton, Ky., on December 9, 1898, and attended the University of Kentucky. He entered railway service on March 30, 1921, as a water works helper on the Illinois Central at Princeton, and was promoted to repairman on August 16, 1922. On May 15, 1926, Mr. Martin was advanced to supervisor of water service on the Gulf & Ship Island (part of the Illinois Central system) and when that position was abolished on February 1, 1929, he returned to the Kentucky division as a water works repairman. On June 1, 1929, he was appointed motor car repairman at Princeton and on September 15, 1931, he was appointed water works repairman at Paducah. On May 1, 1932, Mr. Martin was promoted to water service foreman on the Kentucky division, with headquarters at Paducah, and on November 1, 1940, he was advanced to supervisor of bridges and buildings, with the same headquarters, which position he held until his recent promotion effective May 1.

G. E. Martin

(Continued on page 434)

Mr. Knowles was born at La Porte, Ind., on July 7, 1879, and attended Farrell's School for Boys, Hopkinsville, Ky., took special courses in private schools and an International Correspondence School course in civil engineering. He entered

Clarence R. Knowles

railway service in 1900 as a water service repairman on the Illinois Central and in 1902 he was promoted to water service foreman. Four years later he was appointed inspector of water service and in 1912 he was advanced to general foreman of water service. He was promoted to superintendent of water service, with headquarters at Chicago, in 1916, which position he held until his retirement. Mr. Knowles has been active in the affairs of numerous associations for many years, including the American Railway Engineering Association, of which he was a director from 1930 to 1933, chairman of the Water Service committee from 1922 to 1930 and chairman of the Maintenance of Way Work Equipment committee from 1931 to 1937. He was president of the American Railway Bridge and Building Association in 1921 and 1922 and editor of the Water Service section of the 1926, 1929 and 1939 editions of the Railway Engineering and Maintenance Cyclopedia. Mr. Knowles was also chairman of the Illinois section of the American Water Works Association in 1928 and 1929 and a national director of that association from 1930 to 1933.

Obituary

W. Christianson, roadmaster on the Canadian Pacific at Macleod, Alta., died on April 11, following a stomach operation

Peter J. Keenan, track supervisor on the Erie, with headquarters at Cuba, N.Y., died of a heart attack on March 19 at the age of 67 years.

Lawrence J. Quinn, who retired as supervisor of track on the Chesapeake & Ohio at Logan, Ohio, in 1935, died in Springfield, Ohio, on March 22 at the age of 82.

William H. Armstrong, who retired on December 31 as roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Aberdeen, S.D., died on February 17 in St. Luke's hospital in that city after an illness of several weeks. A biography of Mr. Armstrong's career, following his retirement, was published in the April issue.

John C. Wrenshall, retired engineer maintenance of way of the Reading, whose death on March 1 was reported in the April issue of *Railway Engineering and Maintenance*, was born at Baltimore, Md., on August 12, 1868, and attended the University of Virginia. He entered railway service on June 1, 1891, as an assistant supervisor on the Baltimore & Ohio at Cumberland, Md. In the following year he was promoted to supervisor at Hagerstown, Md., and in 1895 he was transferred to Baltimore. In 1898, he was appointed division engineer at Cumberland, being transferred to Washington, D.C., in 1899. In the following year Mr. Wrenshall became a transitman in the chief engineer's department of the Philadelphia & Reading, and shortly thereafter was appointed supervisor at Lebanon, Pa. In 1902, he was transferred to Harrisburg, Pa., and in 1903, to Trenton, N.J. In 1905, he was promoted to division engineer at Harrisburg, and in 1910, he was transferred to Reading, Pa. In 1918, he was appointed division engineer of the New York division, with headquarters at Philadelphia, and in November, 1923, he was advanced to engineer maintenance of way, from which position he retired on September 1, 1934.

Supply Trade News

General

The Rails Company, New Haven, Conn., has moved its New York office from 50 Church street to 115 Observer highway, Hoboken, N.J., in the express building of the Delaware, Lackawanna & Western.

Personal

E. W. Jackson, general service manager of the **Caterpillar Tractor Company,** Peoria, Ill., has been promoted to assistant to the president.

Charles Neal Barney, Scarsdale, New York, treasurer and head of the legal department of the **Worthington Pump & Machinery Corp.,** Harrison, N.J., has been elected a vice-president of the corporation. Mr. Barney formerly practiced law in Massachusetts and was a lecturer at Northeastern Law school and Boston University Law school. He is a member of the American, Massachusetts and New York, Bar Associations, author of the law text "Equity and Its Remedies" and was, early in his career, mayor of Lynn, Mass.

Gail E. Spain, general sales manager since November, 1940, for the **Caterpillar Tractor Company,** Peoria, Ill., has been appointed vice-president. **John Q. McDonald,** export sales manager since May, 1940, succeeds Mr. Spain as general sales manager. **J. D. Fletcher,** vice-president, will take over the active direction of export sales, in addition to his duties as head of the export department. Mr. Spain succeeds the late **D. G. Sherwin** and will move to Caterpillar's San Leandro, Cal., office to direct activities there and coordinate operations with those in Peoria.

L. S. Hamaker has been appointed assistant general manager of sales of the **Republic Steel Corporation,** with headquarters at Cleveland, Ohio. He was formerly general manager of the Berger Manufacturing division of Republic Steel at Canton, Ohio. Mr. Hamaker's first

L. S. Hamaker

contact with the steel industry was as the operator of a billet pusher on a bar mill heating furnace in one of the Canton mills, now part of Republic Steel. During World War I, he served in the United States Marine Corps, returning to Canton in May, 1919, to join the sales department of the Berger Manufacturing Company, later transferring to that company's advertising department. In 1925, he became advertising manager of the United Alloy Steel Corporation of Canton, with which the Berger Company had been merged shortly before. When United Alloy was subsequently merged with the Central Alloy Steel Corporation of Massillon, Ohio, he became advertising manager of the latter company. The Republic Steel Corporation acquired Central Alloy Steel in 1930, and in 1931 transferred Mr. Hamaker to Youngstown, Ohio, as sales promotion and advertising manager. When the Berger organization was set up as a division of the Republic Steel Corporation in 1934, Mr. Hamaker was made general manager and continued to serve in that capacity until his new appointment.

Obituary

J. C. Barr, district sales agent in New England for the Rail Joint Company, with headquarters at Boston, Mass., died on April 28 at Palm Beach, Fla. Mr. Barr entered the service of the Weber Rail Joint Manufacturing Company in 1899 as representative in charge of the Boston office, covering the New England territory. About three years later he was appointed general sales agent of the same company with headquarters in New York. In 1905, the Weber Rail Joint Manufacturing Company was consolidated with other concerns to form the Rail Joint Company, and since that time Mr. Barr had served as district sales agent for the latter company at Boston.

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WOOLERY TIE CUTTERS

will save you 30% in time and labor expense on your tie renewals—yes, and do it without disturbing the surface of your track. The Woolery Tie Cutter cuts the old tie in three pieces which are easily lifted (not dug) out and the new tie can be placed right on the compacted bed of the discarded tie—less surfacing work, less time required in replacing ties, lower maintenance costs when you use a Woolery.

The Woolery Machine cuts the tie in three pieces, which are easily LIFTED (not dug) out

Saving 12 cents per Tie on every renewal, completing your program weeks, even months ahead of schedule, are very definite reasons why you should let the Woolery Tie Cutter renew your ties the Modern Way. The Woolery Tie Cutter is rugged—compact—a one-man unit so light in weight it can be easily removed from the track by its operator in 10 seconds.

WOOLERY WEED BURNERS

provide the least expensive method of weed destruction and afford maximum safety, speed and flexibility. They are available in sizes ranging from the one-man Woolery Portable Junior Model to the five-burner GIANT OCTOPUS which spreads a solid wall of flame 25 ft. wide, and which can be extended to a flame width of 35 ft. for burning ditches, slopes, etc.

Junior Portable Model for use on or off track

Giant Octopus Model with 5 burners—for main line track

WOOLERY WEED BURNERS are saving money and simplifying track maintenance for more than 60 roads in the United States and foreign countries.

Write for full information—TODAY!

Giant Octopus Model with 3 burners. Midget Octopus Models with 2 burners for branch lines and terminals also available.

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RAILWAY MAINTENANCE EQUIPMENT
Tie Cutters Switch Heaters Motor Cars
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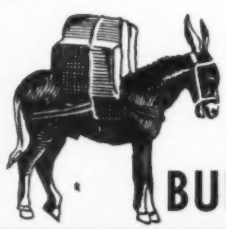
BURRO CRANES? just ask the man who runs one!

● There is a lot of difference between claims and performance. What counts is every-day-on-the-job results. So, we suggest that the best place to get the facts about BURRO CRANES is from the man who runs one. We're too modest to say some of the things you'll hear from him because you'll be listening to a man who is invariably proud of the machine he operates.

Our Bulletins F-100 and F-110 describing the small and large size BURROS make interesting reading to railroad men. They have facts, figures and pictures which show the wide range of utility and many exclusive features that make it so economical to "spot" a BURRO wherever there is work to be done.



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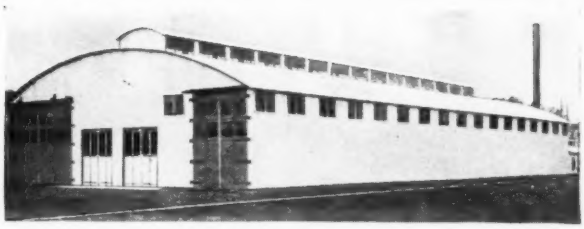
BURRO CRANES

AMERICAN RAILROADS MODERNIZE WITH BUTLER READY-MADE STEEL BUILDINGS

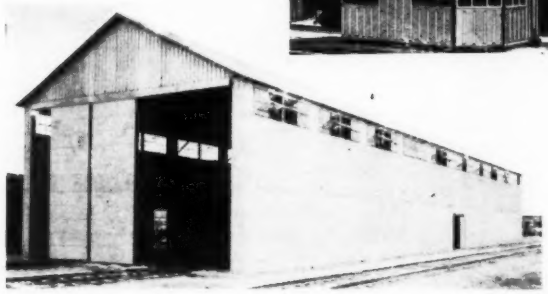


At top—Lined interior of steam heated 90'x200'x22' Butler steel building (Above) housing fruit handling docks.

At left—Butler motor track car and tool house.

At right—Butler freight car scale house.

Below—Butler 40'x160'x22' railway car repair shop which survived a tornado.



Keeping the greatest volume of freight in history moving swiftly and uninterruptedly along the **248,000 MILE BATTLE LINE** of **AMERICAN RAILROADS** calls for ever expanding facilities of the modern type. Perishable food cars, for instance, are no longer unloaded outside in freezing temperature. Instead, cars are switched to docks housed in steam heated Butler Steel Buildings.

Many railroads have long since found that Butler Steel Buildings—factory fabricated for speedy erection—lessen the investment and quicken the charge-off. Structurally strong, fire-safe, readily insulated, heated or air-conditioned—*they permanently house space for freight handling, materiel storage, warehousing, equipment repairs, machine shops, maintenance of way equipment, etc.*

There are three helpful Butler Steel Building Books. One shows more than a hundred Butler Buildings as used in a score of industries. Another, Butler Boulevard Buildings (steel inside and out). The third, Butler made USS Panelbilt Buildings.

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ALPHABETICAL INDEX TO ADVERTISERS

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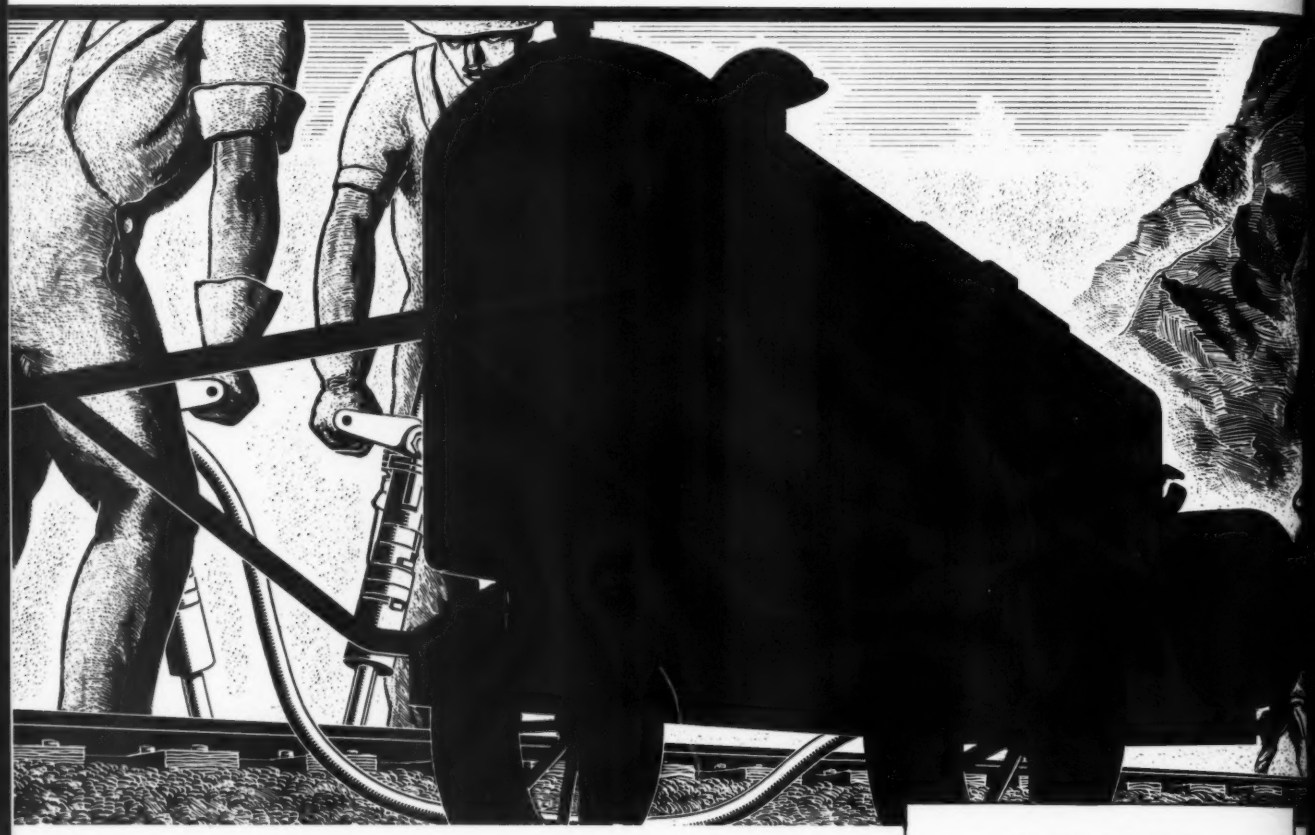

The men who use 'em say Blue Brutes are best — because those road-wise, cost-conscious maintenance men want more air for less money — and get just that. For instance, take a look at the compact, powerful, Hand-i-air Compressor shown above. A "half-pint hurricane" of 60 cu. ft. capacity, it's *just right* for tie-tamping and most railroad jobs.

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Save Time, Money, Metals, Equipment with Worthington's New Free EQUIPMENT-SAVER

How to get the most out of your present equipment is explained for your men in Worthington's new EQUIPMENT-SAVER. It's a *complete* guide, divided into sections ready to post on the job. It tells briefly and simply how to save precious time, tools and materials. Write to Holyoke for your copy today!

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